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# Inspection Methods and Their Application

By Fred H. Colvin
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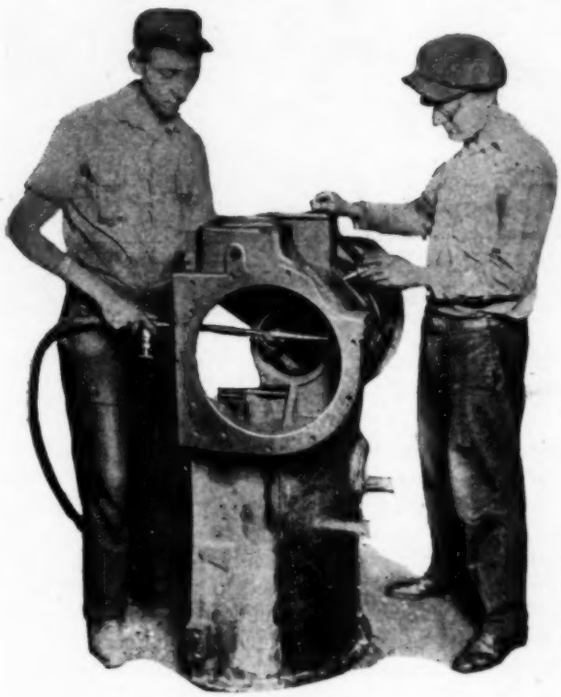


*Fig. 1—Testing the porosity of castings at the Caterpillar Tractor plant. Oil is put on the outside of the casting and allowed to run down over it. A jet of compressed air is then directed against the opposite side of this wall, so that any porosity is shown by small air bubbles forming under the oil*

INSPECTION, as generally considered, may be defined as the examination or checking of the various parts that enter into any mechanism, both as to their dimensions and finish, and to insure mating parts fitting together so as to function properly when finally assembled. The application of inspection in various plants however, varies not only as to method, but as to the attitude with which it is approached and conducted.

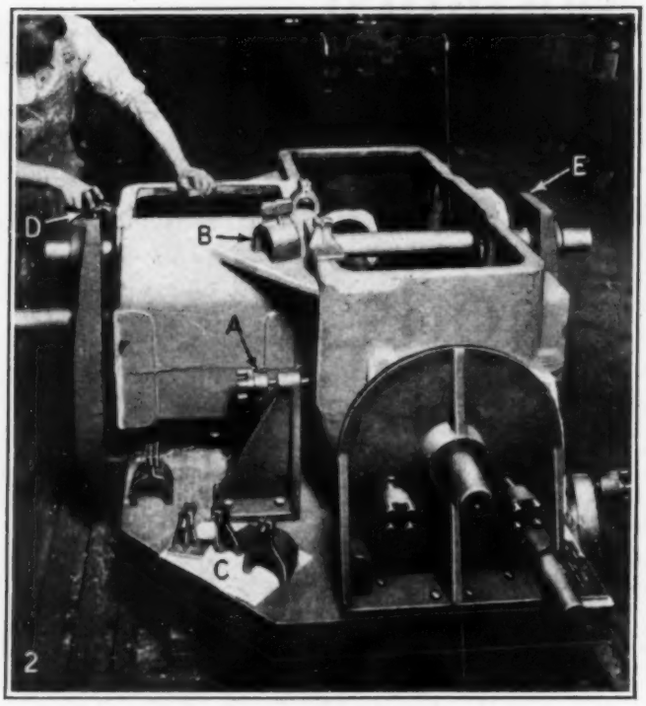
Some inspectors seem to feel that their duty lies in rejecting as much work as possible. The more modern attitude, however, is to so co-operate with the production department as to secure the greatest number of pieces that will function properly in the completed mechanism. In other words, inspection should, so far as possible, be used to prevent work being spoiled and scrapped, rather than to be solely a post-mortem examination after the damage has been done.

There are, naturally, many and diverse opinions as to the best method for securing the desired results. In some plants the inspection department is a part of production. In others, it is under the sole jurisdiction of the engineering department, while in a large number of plants the chief inspector reports directly to the general manager instead of either to the production or engineering departments. In some plants the "quality engineer" heads inspection and reports direct to the general manager.

It is felt by many that if inspection is under the production department, that it is hard to expect it to reject as much work as it should, particularly when the sales department is crowding production for increased output. With inspection entirely under the engineering department, production men frequently claim that work is rejected that will function perfectly even though some non-essential dimensions are outside the prescribed tolerances. With inspection under the direct supervision of the general manager, it is entirely free from the influences of both production and engineering departments, and, presumably at least, steers a middle course. If under these conditions, either production or engineering objects to the way inspection is made, the matter is brought directly to the general manager, who acts as the arbitrator in the dispute.

Those who have studied the question carefully, seem to be of the opinion that much of the confusion and contention can be avoided by exercising much greater care in the study of tolerances on the various pieces. The production men naturally ask for as large tolerances as possible in order to reduce the number of rejections on finished pieces. The engineering department on the

The first article of a series. The second will appear in an early issue.



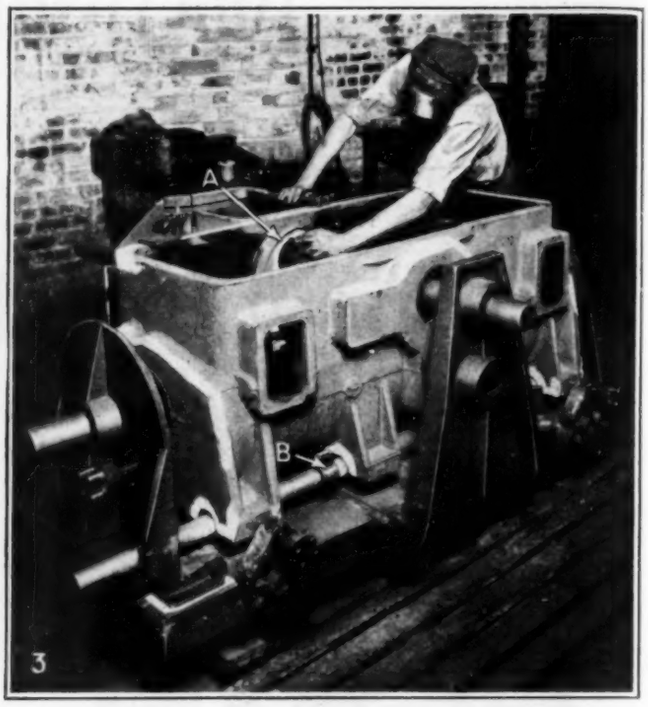




*Fig. 2—Casting for a 60-hp. transmission case being checked and laid out to locate bearings and surfaces to be finished, also to be sure that there is enough metal to clean up. Fig. 3—Another view of the same fixture and casting. The large bore is being checked and laid out. Other parts of the casting are painted for scribing*

other hand, is too apt to set closer tolerances than necessary, on at least some of the dimensions. Knowing that half or even quarter-thousandths can be obtained by careful workmanhip, it is perhaps quite natural to think that a thousandth of an inch is ample tolerance in almost any case.

This attitude of mind results in settling the tolerances unnecessarily close on parts where they are not at all essential. As a result, we find instances in which a thousandth tolerance is demanded, where ten or even twenty thousandths would have no effect on the proper functioning of the mechanism.

There seems to be little question that the vital tolerances, those which affect the proper functioning of the mechanism, should be set by the engineering department. The engineers, however, should bear in mind that extremely close tolerances generally mean higher cost of production and more rejections. Wherever possible inspection should consult with the production department, concerning the difficulty or the feasibility of securing the tolerances desired, and unless absolutely necessary, extremely close tolerances should be avoided. If it is necessary to have tolerances in tenths of thousandths in a few cases, they can be produced with suitable machinery and skilled men, but there are too many cases where dimensions that have no effect whatever on the proper functioning, are marked with one or two thousandths tolerance.

An instance of this is the width of gear face in automobile transmission. While it is perfectly feasible to hold the width of the face within a few thousandths, a variation of thirty or more thousandths would probably make no material difference in the functioning or wear of the gear. But so long as the specifications call for a tolerance of only two thousandths, the inspector can reject any variation beyond this point. The difficulty is that when business is brisk and gears are in demand, the close tolerance is very apt to be overlooked. If, however, the demand falls off, it gives an excuse for rejecting a gear that would otherwise be accepted and that would prove perfectly serviceable in use. This is especially true where parts are purchased from outside manufacturers.

Whether the responsibility for inspection is under the general manager, the engineering or the production departments, there are still widely varying practices as to how inspection is carried on. It is apparently common practice to have the first piece of a new job thoroughly inspected before starting the operator on the run. After, however, a satisfactory piece has been produced, methods vary more widely as to the further inspection.

In some shops a floor inspector makes frequent rounds of the varying machines and inspects the work as it comes off of them. In such cases, practice varies as to whether the work is inspected by the operator or not. In most cases the inspector seems to be expected to check up occasionally pieces, if not each piece, as completed. On many kinds of work it is customary for the workman to check each piece before it comes off of the machine, using some sort of fixed gage or even a micrometer, in much the same way as the old-time machinist used his firm-joint caliper. The foreman, too, frequently uses the workman's gages from time to time so as to aid in keeping the spoiled work turned out by his department as low as possible. Sometimes the foreman has gages of his own.

The plan of having the workmen use gages, except perhaps where the production is extremely automatic, as on the screw machines, is generally considered as hav-

ing a good effect in maintaining personal interest in the work and imparting a sense of responsibility, which is highly desirable. In most cases, all gaging instruments, including micrometers, are inspected in the toolroom at frequent intervals, whether they are privately owned or not. There is a decided tendency, however, toward having all micrometers and similar instruments owned by the company and kept in the toolcrib, and this system has advantages.

Practice as to the inspection of rough stock varies widely. In some shops it is taken for granted that castings and forgings will clean up at all points. Too much stock becomes noticeable in the depth of cut required in the various operations.

The source of supply has much to do with the necessity for rough-stock inspection. But a large amount of money may be involved in tying up expensive machines with castings or forgings that prove to be defective, in the cost of the delay in production and in the labor wasted. This condition makes it seem advisable to many to carefully inspect in the rough such parts as cylinder blocks, crankcases, transmission cases, connecting rods and other pieces before they go to the machining department.

Some of the fixtures used for this preliminary testing are ingenious, and examples from different plants will be shown. In a few instances the foundry or forge shop is also supplied with gages or fixtures for inspecting parts before they are delivered. Sometimes these gages or fixtures are duplicates of the ones used in the preliminary shop inspection, but in others they are of simpler design for a less complete inspection.

Believing that prevention is better than cure, the Caterpillar Tractor Company, Peoria, Ill., spends whatever time is necessary to thoroughly inspect and check important castings before sending them to the machine department. One of the first tests is for possible leaks, and. wherever light surface-defects in castings appear, the test shown in Fig. 1 is made. A liquid is applied on the outside by means of a squirt can, as shown, and an air jet is immediately blown against the inside of the casting around the whole area that might be affected. If a bubble is detected, the casting is rejected and must be passed on by the salvage department before being used.

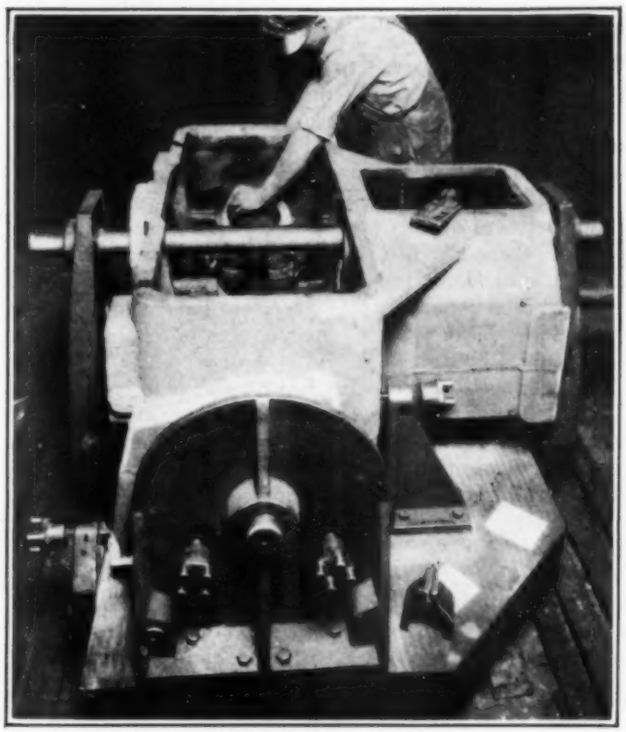
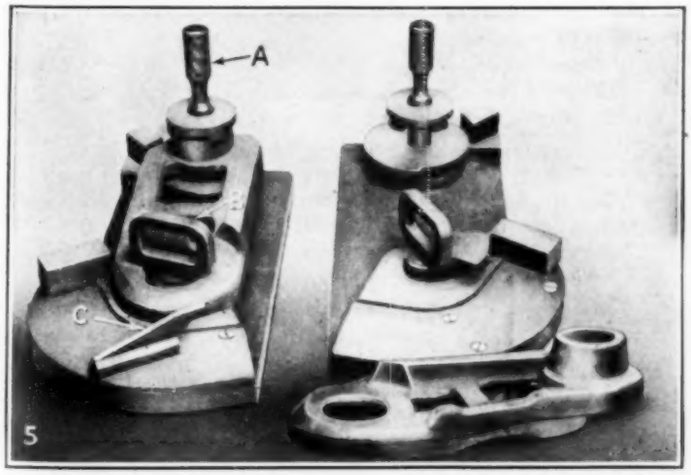


*Fig. 4—End view of the fixture and the casting showing the type of holding screws, also the scribing tools more in detail. This view shows, in combination with Figs. 2 and 3, the complete way in which the main fixture checks all the important points*

If the casting is considered sound, it goes to an inspection fixture, as in Fig. 2, where all the portions that have to be machined or that affect clearances of moving parts are carefully checked. This view shows a 60-hp. trans-



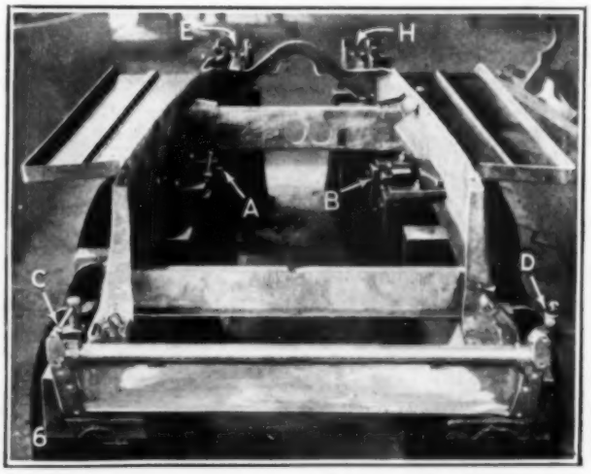




*Fig. 5—Gage for checking rough forgings used on the tread of the Caterpillar tractor. This gage checks the main dimensions of the link forging, both as to location and clearance. In this way, any wear of the dies can readily be detected. Fig. 6—Checking an assembly fixture for Marmon automobile frames. This fixture combines the checking of the various sheet metal parts, and also holds them in correct position for assembling. Means are provided for checking the cars to which the springs are connected to the frame, to insure correct alignment*

mission case being laid out and the bearing bores being checked. All surfaces, inside and out, are checked with this fixture. The case is adjusted in the fixture by means of screws such as *A*, and the various aligning bars are put through in both directions. Using these bars as bearings, the various bores are laid out by such scribers as the one shown at *B*, the scribers being placed over the shaft and rotated upon it as is being done in Figs. 3 and 4. Other scribers of this type are shown at *C*, Fig. 2. In addition, there are also scribers for flat surfaces, one being in use at *D* for indicating the amount of metal to be removed at this point. These scribers have a flat surface and are moved along the plane surfaces as at *D* and *E* on the fixture.

Another view of the same fixture and case is shown in Fig. 3 and shows how the various scribing operations are performed. The bore at *A* is being scribed and another scriber is in position at *B*.

Still another position is shown in Fig. 4, the three views giving a comprehensive idea of the construction of the fixture and the way in which the aligning bars and tools are used. The fixture is of heavy design and construction and yet is so built as to be easily used. After an operator becomes accustomed to this work, the complete laying out is done in much less time than might appear possible.

### An Example of Forging Inspection

A good example of the inspection of forgings was also found in the same plant. The side links used in the track that forms the caterpillar-tread is a drop forging and the holes for the connecting pins only are machined. It is necessary, however, that the various projections have proper clearance so that the links can articulate freely when in action. Fixtures for both right and left links are shown in Fig. 5, the one at the left having the link in position, while the one at the right shows the appearance of the gaging fixture itself.

With the link placed in position, plug *A* tests the concentricity and diameter of the outside of the pin bearing. Plug *B* carries a projection wing that, when the plug is turned in the hole in the fixture, shows whether or not the mating link will clear the projections. Gage *C* has an angular projection that must clear the bevel on the edge of the link when the end of the gage resting on the plate, as shown, is in contact with the raised portion under the end of the link.

By checking a certain proportion of the forgings before they go to the machine department, a lot of unnecessary work is saved and it is an easy matter to detect wear in the forging die. If, for example, the bevel gage *C* should not quite clear in some instances, the links would be salvaged by grinding, but immediate steps would be taken to repair or replace the dies before the next lot was forged. Much unnecessary machining can be obviated by occasionally checking forgings in some such manner as indicated here.

An example of the extent to which an assembling or machining fixture may become part of the inspection methods is shown in Fig. 6 from the plant of the Marmon Automobile Company, Indianapolis, Ind. The frame is that of the large Marmon car which, it will be seen, has very deep sides to which the running boards are directly fitted.

The side frames are held in position by the vises *A* and *B*, the outsides being supported by a substantial casting that forms part of the assembly fixture. Here the cross members are assembled and riveted in place, including the engine bearer at the front end and the cross-members at the rear, nearest the reader. The side frames are laid in this fixture and are supported on its planed surfaces, which insures alignment and also aids in assembling the cross-members. Screw vises *C* and *D* clamp the back end of the frame, and similar provisions are made at the front end.

The ears at *E* and *H* are for checking the alignment of the holes in the front spring-hanger connections, which are not yet in place. After these connections have been attached, a test bar or shaft is run through the ears *E* and *H* and also the spring hanger connections which are between them. In this way, the ears must be in alignment, or the test bar will not pass through them. When the frame comes off of this fixture there can be little question as to the alignment and position of the various members that make up the frame as a whole.

## Purchasing Abuses

W. W. Nichols

IN THE nine years ending in 1925 more than 34 per cent of all corporations in the United States failed to show any net earnings. I have no hesitancy in charging this mainly to our peculiar American competition.

Any action taken by a business man contrary to the general welfare reacts, sooner or later to his disadvantage. Therefore, the success of the vendor is of the greatest consequence to the ultimate success of the purchaser. The widespread violation of this principle results in abuses which require correction. Secretary Hoover has warned us several times that if business fails to handle its affairs in the community interest, government will step in and assume the task. Owen D. Young has said: "Too frequently business men have acquiesced, even if they did not participate in objectionable practices, until an outraged society compelled amateurs to interfere."

One of these purchasing abuses is charged against the engineer. The practice of furnishing working drawings with proposals, originally prompted by an occasional necessity, has resulted in cribbing legally protected information. The ruthless disregard of patent and other rights became so offensive that it invited the consideration of our national associations of engineers.

Another abuse is unwarranted price cutting. When a purchasing agent pits one bidder against another until the price is cut to less than cost he inflicts injuries on an industry which is necessary to the operation of his own company. His suppliers must not only make a reasonable profit but also have funds for progress, engineering, and improvement in design. If they do not he suffers with them. Within the year the General Motors Corporation, voluntarily allocated its orders at an advance over quoted prices, in order to preserve an industry in which it had a vital concern. Short-sighted purchasing policies never ensure lasting benefits.

Paper presented at Executive Conference of the Purchasing Agents Association, May.

# Glimpses in the Citroen Works

Photographs by courtesy of André Citroen, Paris, France

*Fig. 1—Office of the production department. The production-schedule boards are to be seen in the center. The overhead, round radiator for heating the office is a prominent feature*

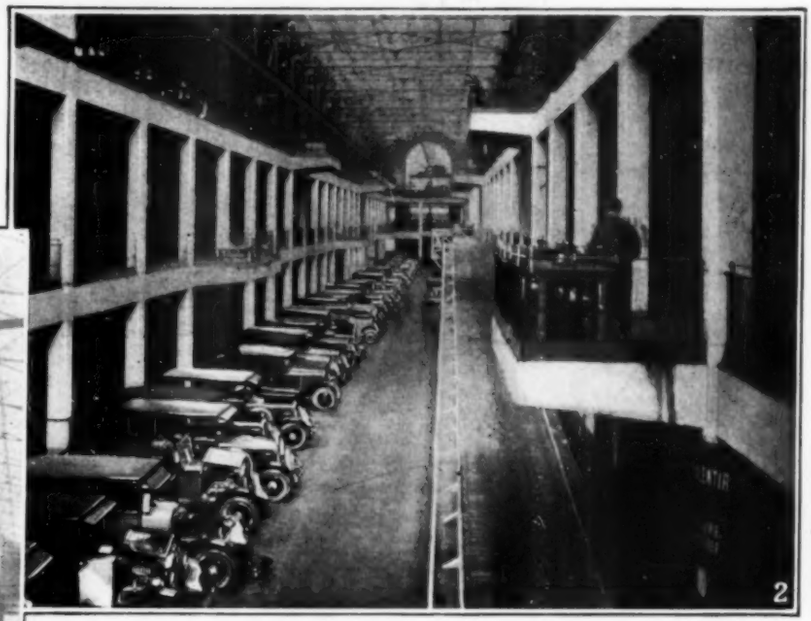


*Fig. 2—Repair department, Paris service station. Note the projecting platforms to facilitate crane service to each floor and also the ramp leading to the second floor*

*Fig. 3—An unusual forge shop. Note the large amount of glass in the roof and monitors. The steam hammers and trimming presses have plenty of room around them*

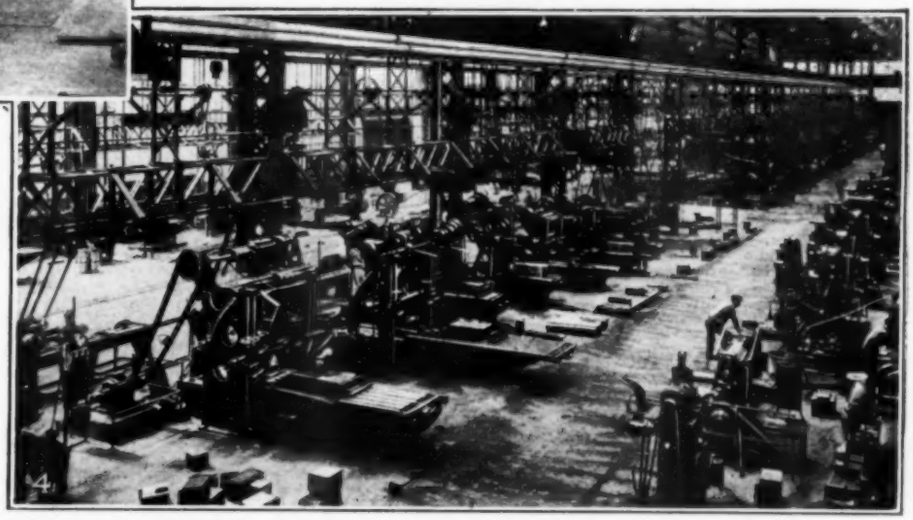


*Fig. 4—Making punches and dies for the press department. The extent of this toolroom gives a good idea of the quantity of punches and dies used. Most of the machines shown are motor driven*

(Concluded on following page)

*Fig. 5 — Where machine tools and similar equipment are repaired. Here the machines are dismantled and any repair work done to bring them back into productive condition. The traveling crane handles the machines easily*

*Fig. 6—Laboratory for testing materials. Note the wall decorations. They have been found to have such a beneficial effect on the work and the workers that the idea is to be extended*

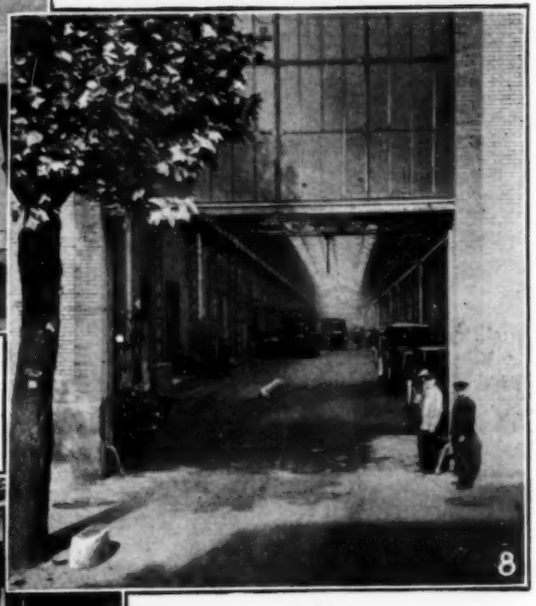


*Fig. 8 — One of the main entrances to the shops at Clichy. This leads to a passageway between two of the buildings, which is roofed with glass as a protection against weather*

*Fig. 7—Small parts forging department. Each trimming press is electrically driven and the inlet and outlet pipes of hammers come from mains under the floor. The furnaces are oil fired. The forgings are handled in steel boxes mounted on wheels*

# Royalties to Company Officials

EXECUTIVE trouble was brewing at the plant of the Brand Turbine Wheel Company. The general superintendent had perfected a new pump at his own expense and wanted a royalty on each installation. The matter was brought up at a Board meeting, and then the fireworks began. Some of the Board members were in favor of voting the royalty, but others stoutly maintained that a general superintendent owed it to his job and to the company to give executive thought at all times to improving the product, especially when he was a stockholder, and that he was not entitled to a royalty on improvements or new inventions. One or two others claimed that the stockholders would "yell like sixty" when they heard that an executive was getting a "side graft" for doing what any good executive ought to do.

When the atmosphere began to get too heavily charged with lightning, Brand, chairman of the board, called for an adjournment of the question until everyone had a chance to think it over outside. Then he hastened to the office of William Holland, whose judgment on executive matters was already well known in that section, but whom Brand had met only a short time before.

"It's this way, Mr. Holland," he began, as he puffed one of the latter's cigars. "Our Mr. Jackson, the general superintendent, has patented a new turbine pump at his own expense. He wants us to make it and pay him for it. There are several sides to it. Should we pay him anything? If we do pay him should it be a percentage of the sales price, of the profit, or a fixed price per pump? What has your experience been in cases of this kind? Is there any general practice."

"You're up against a stiff question, Mr. Brand, one that too often ends in hard feelings, if nothing worse. I'm not going to talk law to you because I don't know it and because these things can usually be settled better on a man-to-man basis. It's an open question, perhaps, as to whether Jackson's new pump belongs to you or not. But even where there is a contract covering new devices or patents, it isn't clear sailing by long odds."

"Does he deserve anything beyond his salary, Mr. Holland? How could he help getting his ideas from our work and how do I know he didn't work it up on my time?"

"You'll have to answer that yourself, I'm afraid. If you were in Jackson's place would you consider the salary covered any idea you might evolve? Would you be quite happy to see all the benefit of your idea going to the man you worked for?"

"But I have all the expense of experimenting and of marketing the pump, I take the money risk, he risks only a little time."

"True, Mr. Brand, but he hasn't anything but time and energy to risk. You can afford to risk money better than you can either time or energy. Regardless of the legal side that might say it belonged to you, wouldn't it be policy to make it an inducement to him to devise new and better pumps? I can hardly imagine a super's salary so large that a bonus on the side, in the shape of royalty, wouldn't interest him."

"Then you think I ought to pay him a royalty, Mr. Holland?"

"I'm not advising anything. I've just pointed out one side of the case. On the other hand, if you do pay a good royalty there is a possibility that Jackson might become more interested in inventing than in managing the shop. I've known such cases. If this happened, and you let him go, it might look as though you were afraid he'd make too much money, when that wouldn't be the real reason at all."

"Suppose I decide to pay him for the idea. Would you suggest a royalty of so much per pump, a percentage of the net profits on the pump, or a sale price?"

"The man who isn't familiar with costs of developing and marketing usually imagines profits to be much larger than they really are. So a part of the net profits would probably be fairer to both sides. On the other hand, it is easier on the bookkeeper to have a fixed amount per pump.

"When a man hires out as a designer he usually contracts that his designs belong to the company. When he designs on the side he feels he ought to get a bonus, often overlooking the fact that he may have, quite unintentionally, neglected his other job somewhat to do it."

"But suppose Jackson was an active, salaried officer of the company, say a vice-president, Mr. Holland?"

"Makes it a bit more complicated, Mr. Brand. Puts him in a different class from superintendent. I've known some pretty serious mixups from officers drawing bonuses, yet in some cases it has worked out well."

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Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

## *Discussion*

### Vacations—Singly, or All at Once?

Concentrated vacations are of great benefit in keeping production at a uniformly high level before and after the vacation period. This is due to the workers' co-operation and loyalty, an appreciation shown the company for the vacation. The adoption of a uniform vacation plan, where the whole plant shuts down for a specified period, insures co-operation, and eliminates disorganization. Moreover, the necessary repair work can be done without interfering with production, as a crew of maintenance men is left to do this work when the plant is closed, these men being given vacations at another time. —JOSEPH BELL.

### Training Men for Different Jobs

The problem of training men for different jobs cannot be solved by charts or graphs in a personnel office. It should be placed directly in the hands of the foreman. There is no reason for an executive to feel sorry for the one-operation man, because the vast majority of those engaged on repetitive work really like it for that one reason.

The foreman who is alert and sympathetic in his relationships with his men can easily recognize the men who are ambitious and have the will to get ahead. These men are the ones to whom he should give the training opportunities. To have to sell the idea to an unwilling man defeats its purpose. It is the ambitious men who, realizing their opportunities, will understand the motive and even accept the small reduction in piece-work returns, because in so doing they are building for their future. —WILLIAM A. ASHMEAD.

Training men for different jobs will give the company increased profits in cutting down labor turnover. It is, therefore, of great advantage to the company to have men who can be shifted to other work. Of course, not all the workers chafe under repetition work, and those who do not find work of this type monotonous can be placed advantageously on the one-operation job. The hesitancy of the operators in tackling new jobs seems to lie in the fact that most operators today are on piece work, and they really lose money when they tackle a new job. The advantage of training for different jobs should be pointed out to the worker, so that he will understand that it is to his benefit to have the training of several jobs when a period of slackness in his department comes along. —HARRY KAUFMAN.

### Patronizing Home Industry

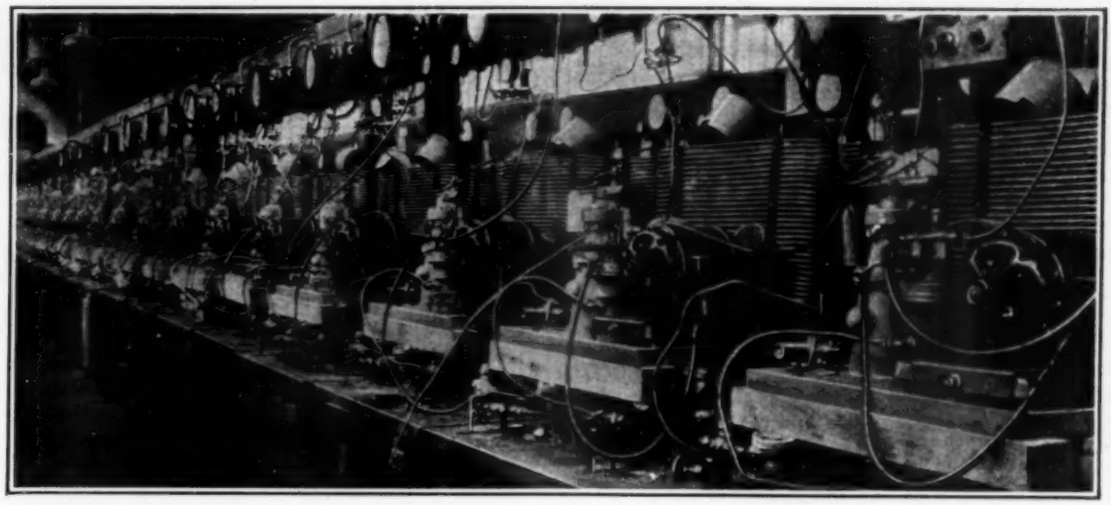
It would seem that Brewster should reconstruct his ideas to an appreciation of the fact that his town will prosper only as the individual industries in it prosper. The reduction of one firm's profits, to bolster up the profits of some less efficient local firm, is not a road to prosperity for either of the firms involved. It is high time that the manufacturer who doesn't see "how anyone can make castings any better or cheaper than I do," and bases his plea for consideration on such a foundation, take a train out of town and pay some visits to other plants. Such a trip may lead to a definite change in policy within his own plant. He may be able to meet outside competition.

In a broader way, no town in itself can absorb all the output of its industries. They must of necessity go afield for customers. While it sounds fine "to keep the money in town," very few of the proclaimers of this policy would subscribe to its complementary proposal that they "keep the outsiders money out of town." Such a situation as that mentioned is not so much an argument for home buying as a challenge to home industries to ascertain the reasons why outsiders can compete successfully, and then apply the necessary corrective measures to themselves.

—D. C. WRIGHT.

Propaganda in favor of patronizing home industry is very well put when it is applied as between the consumer and the retailer. In the retail trade, when account is taken of time, carfare, fatigue, and other things, the bargain obtained outside of the home town is often a more expensive purchase. But when it comes to the wholesale purchase of such a technical product as castings, the home town industry must stand on its own feet and meet quality and price competition from outside on its own merits. The pressure in favor of home town industry should not be applied to Mr. Hartwell of the machine company, but rather to Mr. Thompson of the local casting concern. Mr. Thompson should be urged to make a real study of the machine company's needs, and then attempt to improve his methods to meet its needs in quality and price.

—JOHN W. CAMPBELL.



# Tooling for Refrigerator Units

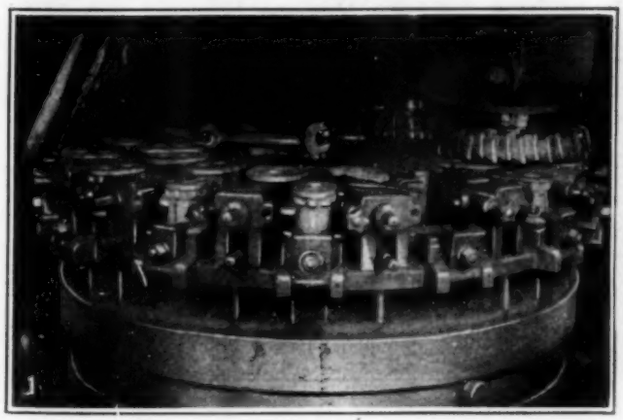
By Frank W. Curtis
*Western Editor, American Machinist*

REFRIGERATOR units made by Servel, Inc., at its Evansville, Ind., plant, consist of two cylinder compressors mounted on base castings and interconnected by tubes, electrical controls, and various operating parts, so that full-automatic operation is obtained. The compressor units are made in quantity lots and somewhat resemble small, two-cylinder gasoline engines.

The cylinder blocks are rough and finished milled on the tops and bottoms in a rotary-type machine as illustrated in Fig. 1. The fixture holds 28 cylinder blocks arranged in two sets so that the inner set of 14 pieces is presented with the bottoms up, and the outer set with the tops up. The spacing is such that two 14-in. inserted-blade cutters will take roughing and finishing cuts on both sets as the table revolves. First, 14 cylinders are clamped in the inner part of the fixture so that their bottoms are machined, then they are transferred to the outer part of the fixture where their positions are reversed. The inner part of the fixture is then loaded with cylinder blocks turned bottom up. Thereafter, 14 blocks milled on both the tops and bottoms are taken from the machine at the completion of each cycle. Both faces have approximately $\frac{5}{16}$ in. of metal removed by the roughing cutter, and $\frac{1}{32}$ in. by the finishing cutter. The fixture has cored pockets under the work-holding surfaces to enable chips to pass out freely. The clamping screws and nuts are located at the outer edge of the fixture, thus facilitating operation.

Following the milling operation, the cylinders are drilled, bored, reamed and counterbored in a turret lathe. The work is held in faceplate fixture so designed that either bore can be aligned with the center line of the machine. The operation is handled so that one bore is completed first, after which the block is released and

The first part of the article. The conclusion will appear in an early issue.



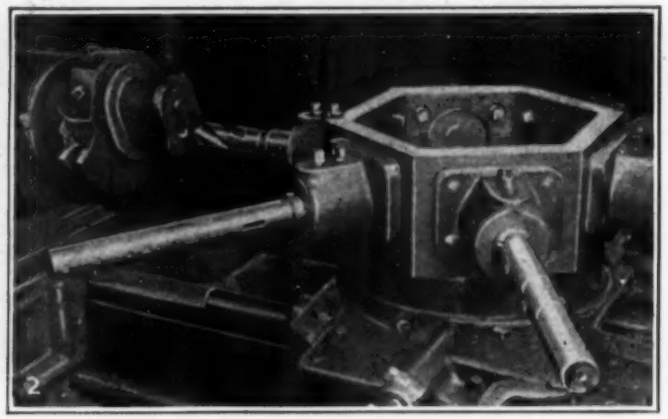


*Fig. 1 — Cylinder blocks for compressors are rough and finished milled in a continuous-type rotary milling fixture by two 14-in. cutters. The fixture holds 28 pieces of which 14 are arranged for the machining of the tops and the balance for the bottoms. Fig. 2—Drilling, boring, reaming and facing a cylinder casting in a turret lathe. After one bore has been completed the work is released and reclamped on the faceplate fixture for finishing the opposite cylinder. The holes are drilled to 1 $\frac{13}{16}$ in., bored to 1.68 in. and reamed to 1.688 inch*

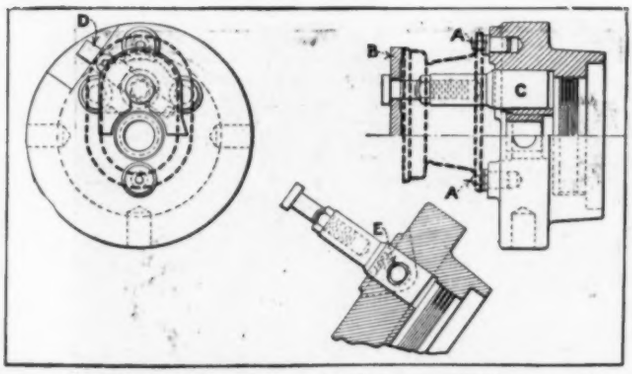
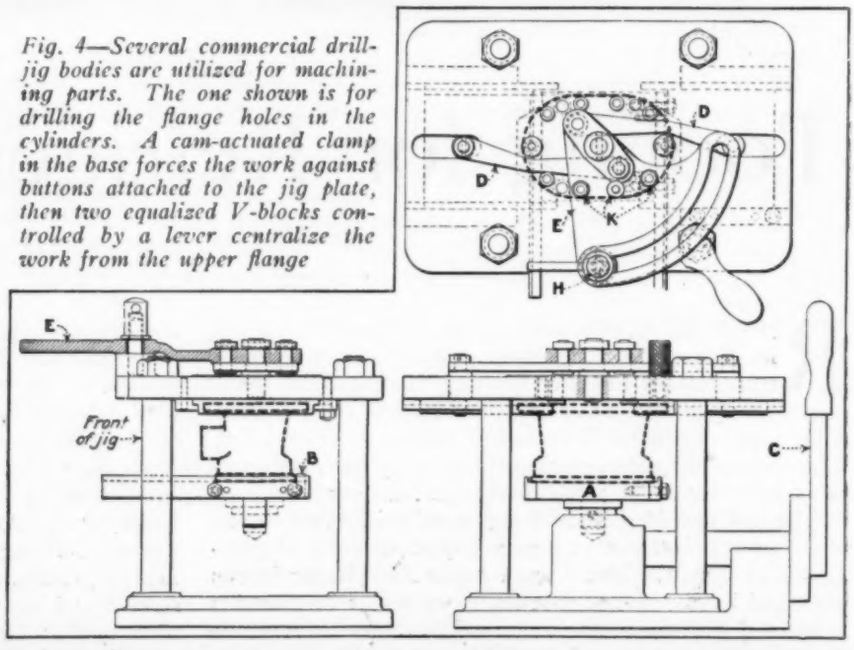
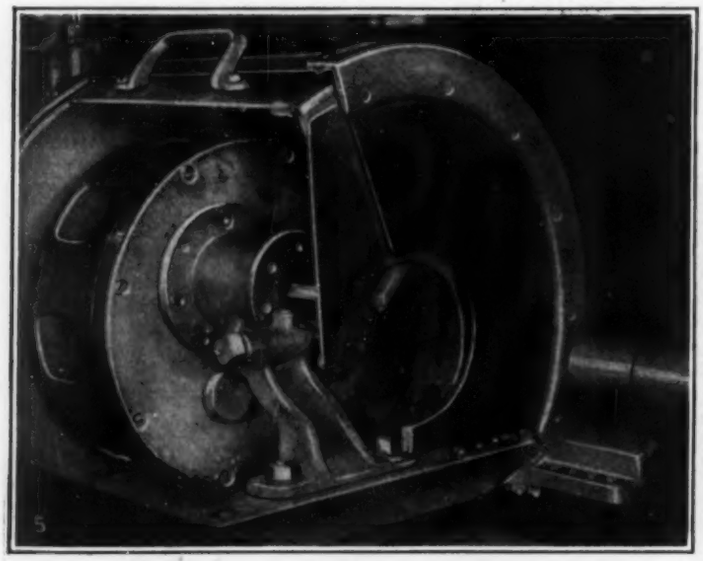



*Fig. 3—The faceplate fixture for boring cylinders provides location of the work by two pins. A C-clamp placed over a floating drawbar holds the cylinder block in place. A bushing supports and aligns the ends of the boring bars*

reclamped in position for machining the second bore. The set-up is illustrated in Fig. 2. The bores are drilled to $1\frac{3}{64}$ in., bored in three cuts to 1.68 in., and then reamed to 1.688 in. Counterboring to $1\frac{3}{8}$ in. in diameter and $\frac{1}{8}$ in. in depth, is accomplished by a spot facer attached to the turret. Constructional details of the faceplate fixture is shown in Fig. 3. The cylinder block is located by the two dowel pins *A*, entering holes in the flange, and is clamped by the C-plate *B* which is placed over the end of the floating drawbar *C*. The drawbar is actuated by the screw *D*, having a cam machined on its body $\frac{1}{32}$ in. off center, which works in an elongated slot in the body of the drawbar as shown at *E*. The fixture body carries a pilot for the boring-bar bushing, and is threaded for assembly to the spindie nose of the machine. Commercial drill-jig bodies of the quick-clamp type, consisting of a base and a jig plate connected by four pillars are used in the machining of parts that lend themselves to this form of tool. Such a jig, arranged for the drilling of eight $\frac{11}{32}$-in. holes in the cylinder housing, is illustrated in Fig. 4. The work is placed on the clamping plate *A* which has two slides extending to the forward part of the jig body to facilitate loading. When the work has been brought against the stop pin *B*, the lever *C*, operating a cam in the base of the jig, is actuated to raise the clamping plate and thus clamp the upper face of the cylinder housing against four locating buttons in the bottom of the jig plate. Radial location of the work is obtained by two sliding V-blocks, also mounted on the bottom of the jig plate. The V-blocks are connected by the equalizing arms *D* to the clamp *E*. The lock screw *H* is used to bind the

*Fig. 4—Several commercial drill-jig bodies are utilized for machining parts. The one shown is for drilling the flange holes in the cylinders. A cam-actuated clamp in the base forces the work against buttons attached to the jig plate, then two equalized V-blocks controlled by a lever centralize the work from the upper flange*



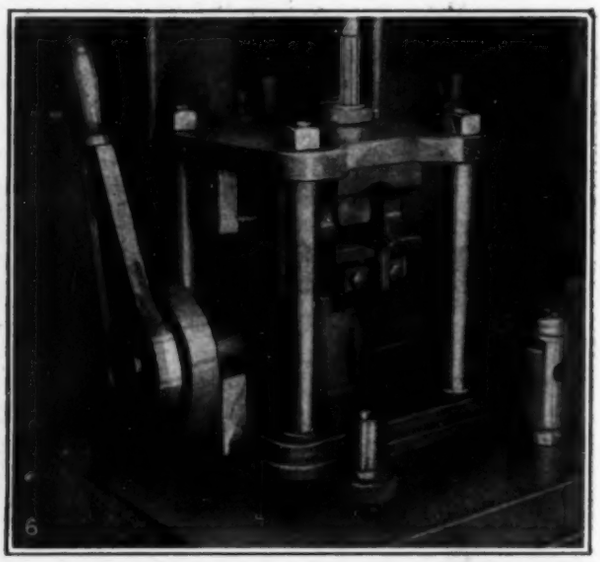


*Fig. 5—After hardened sleeves have been pressed in the cylinder blocks, the operation of grinding is performed. The cylinder block rests on buttons, is located by two pins, and is held in place by a clamp that passes through one of the bores. The machine is of the automatic type and one operator runs three machines. Fig. 6—A cam-operated jig is used for drilling and reaming the wristpin holes in pistons. The work is located by a block attached to the jig plate, and is clamped by a combination device that aligns it endwise and radially. Slip bushings are used in connection with the jig, so that both drilling and reaming can be done at the same setting*

clamp after the work has been clamped securely. The clamp has clearance holes at *K* to permit the drilling of the three holes that otherwise would be covered.

Following this operation, the cylinder blocks are disk ground on their bottoms, tapped, and then hardened-steel cylinder sleeves are inserted. The final operation performed is the grinding of the cylinder bores which is done in an automatic internal-grinding machine as illustrated in Fig. 5. The work rests on buttons and is located by two pins. A clamp passing through one of the bores, holds the work in place. The operation consists of grinding one bore, and then reversing the work as in the boring operation previously described. The bores are ground to 1.5 in. $\frac{+0.0005}{-0.0000}$ One operator runs three machines.

Another quick-clamp type of jig is shown in Fig. 6, arranged for drilling and reaming the wristpin holes in the pistons, after they have been turned, and faced on both ends. The jig has a combination clamping device that locates the piston radially and endwise by one movement of the clamping lever. Constructional details of the jig are illustrated in Fig. 7. The piston rests in a block fastened to the jig plate and receives its approximate radial location from the inner bushing plate *A*. When the lever at the left of the jig is actuated, the plate *B* is raised so that the finger *C* forces the piston inwardly and against the spring plate *D*, locating it endwise. As the plate *B* ascends, pressure on the cam *E* is released so that the arm *H*, to which the cam is attached, is forced inwardly by the spring *K*. On the upper end of the arm are two adjustable screws *L* that engage in the oil-clearance relief on the piston,

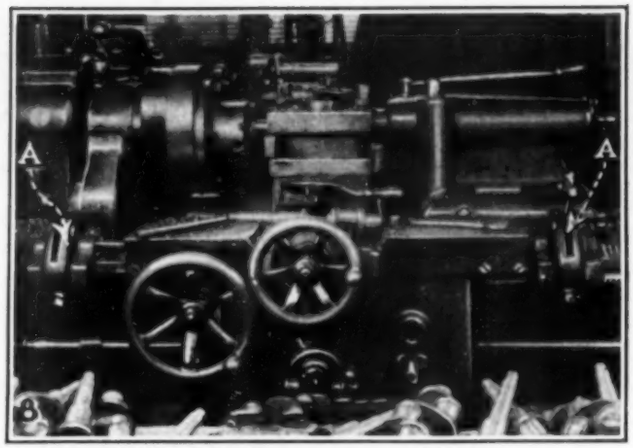



*Fig. 8—Crankshafts, after being end milled and center drilled, have their crankpins turned in a lathe equipped with throw blocks arranged so that both pins can be machined by indexing. The tools are positioned by stops*

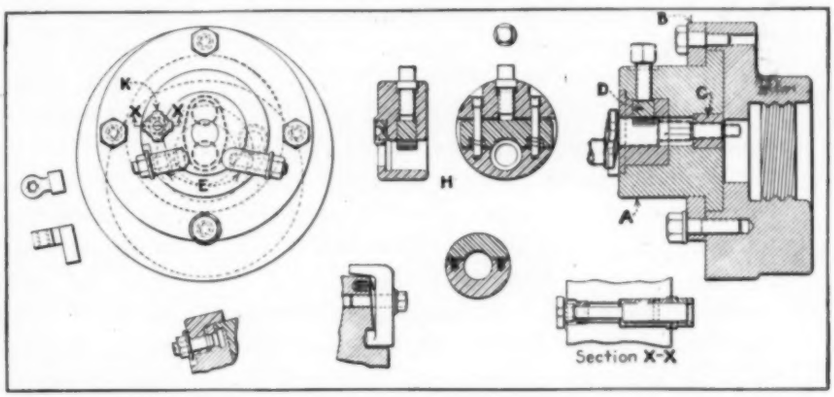



*Fig. 9—Details of the throw blocks for turning the crankpins. Two clamps and a plunger lock and locate the indexing block for each pin. The shaft is held by the finished end in bushings and is prevented from turning by serrated clamps. A counterweight balances the eccentric load*

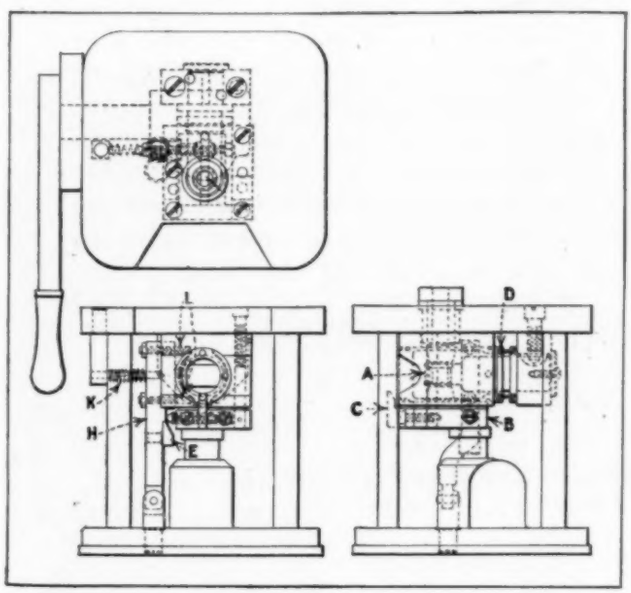



*Fig. 7—Constructional details of the jig for drilling wristpin holes in pistons showing how the work is located and clamped. A commercial jig body of the cam-operated type is used. When the cam lever is operated to raise the plate in the center of the jig, a finger locates the piston endwise, while two pins attached to an arm align it radially*

thus aligning it correctly. Slip bushings are used for drilling and reaming. Crankshafts have their ends straddle milled in an indexing-type fixture in which four pices are set up at each end, one set being machined while the other is being loaded. Following this operation the ends are centered, in which condition the work is ready for turning. The crankpins are turned in a lathe equipped with throw blocks, so that both of the crankpins, located 180 deg. apart, can be machined. The crankshaft lathe illustrated in Fig. 8 has the stop plates *A* attached to the ways to limit the longitudinal movement of the carriage.

Details of the throw blocks are shown in Fig. 9. On the adapter, the chucking body *A* is mounted eccentrically and is held in place by the ring *B*. The work is placed in the opening of the indexing block so that its finished end enters the bushing *C*, in which position the clamp *D* is adjusted to grip the bearing, thus holding the shaft in place. The two clamps *E* are used to align the crankshaft radially. At the opposite end of the shaft is the clamping plate *H*, supported by the tailstock center, and in which are centers corresponding to both crankpins. Indexing controlled by the plunger *K*, shown in the sectional view at *X-X*. The indexing throw block is counterbalanced to offset the eccentric load.

The headpiece illustrates a number of finished compressor units being tested.

## · THE · FOREMAN'S · ROUND · TABLE ·

*The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared*

# *Wear Goggles or Quit*

"WONDER if Williams really means what he says in that last notice about firing any man who uses the grinder without wearing goggles?" asked Ed, as they were leaving the shop.

"Williams doesn't put up any notice just for the fun of seeing his name on the bulletin board, Ed—you bet he means it."

"Just because Jackson got something in his eye last week, I suppose. He took a chance and lost. But it's his eye, isn't it?"

"Not entirely. That eye belonged to Jackson's family as a part of his earning capacity. Might almost say it belonged to the old man as part of what he hires when he pays Jackson."

"I don't get it, Al. Of course a man ought to be careful, but it's getting so a man hasn't any personal liberty at all. Law tells him he can't drink—rules tell him what to wear."

"That personal liberty stuff is all wet, Ed. Robinson Crusoe was the only bird who had personal liberty, and he lost part of that when his man Friday came on the scene. If you were the only man in town you could drive your flivver to the left or right as you pleased. But just try it now and see what happens."

"But wearing goggles is different, Al. You don't hurt anyone but yourself if you do lose an eye."

"Wrong again, Ed. You hurt your family by letting yourself in for doctor's bills. You decrease your earning power. And you may hurt the whole community by being unable to work and have to be supported. So the town, through Williams, has a right to say you've got to wear goggles to protect your eyes, on their account, if not yours."

"Got you there, Al. Suppose I'm fired and can't get a job because I won't wear them. Then who supports me?"

"You do, Ed. There's a nice shoe shop in the 'pen' where you can earn your keep and a little more—and some states send you there, if you don't use safety devices provided by the boss. Got you both ways, Ed. Better forget the idea that you've got too many rights and think how many duties you owe your family and the rest of us."

"I don't mind wearing goggles, Al, but I do hate the notion that I've got to do it."

*Is the wearing of goggles a question for the individual to decide as Ed thinks? Or is Al right in his argument? How can such a rule best be enforced?*

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

# *Discussion of Earlier Topics*

### Helping the Efficiency Engineer

DESPITE the fact that he has recently been under pretty heavy firing, the efficiency engineer is a distinct asset to modern industry. He brings to any manufacturing problem a broad practical training that cannot help but disclose conditions that may be improved. To ask him to function without aid or co-operation from the foreman shows an attitude that is probably the primary fault of the very conditions he hopes to correct. If this attitude is persisted in, the efficiency engineer will undoubtedly accept the challenge, ferret out the underlying conditions, and make good despite the handicap.

When we call in a doctor to assist us in a case of personal illness, the first thing we do is to tell him as much as we can of the history of our case. So it should be with the efficiency engineer, who is really an industrial doctor. —CHARLES E. KIRKBRIDE, JR.

IN EVERY shop there is an element of jealousy, and Brown, who will resent recommendations from his fellow foreman Smith, will readily take them from the outsider. The efficiency engineer can do the most good by doing the thing that everyone knows ought to be done, but which no one has had the courage to suggest nor the opportunity to carry through. The management also can put necessary changes across with less friction by having them come through an efficiency engineer than direct from headquarters. However, this can be accomplished only by having the help of the men.

—J. C. P. BODE.

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### How Much to Spend for Repairs

WILLIAMS should issue an order that no general repairs to a machine be carried out without his orders, and that an estimate for the job must be submitted to him for his decision. To make his decision, he must obviously be acquainted with the financial position of the company, the policy of the management, the capacity of the shop, the age and type of the machine, and the program of work for the shop for, say, the ensuing three years.

Only with this data before him is it possible for him to decide whether it would be better to spend $400 on repairs, or $800 on new machinery.

—A. J. LEE, *Works Manager, Argentina.*

LIKE Williams, I feel that every shop should have a definite plan to keep track of the cost of maintenance of every machine. The scheme I use in my shop is a simple card index system. On each card I state the date when the machine was new. Each repair, no matter how small, is entered and dated. When any one machine shows numerous entries, I submit that card to the superintendent, who in turn passes it on to the master mechanic who is responsible for purchasing and maintenance of machines.

My records show that maintenance is light during the first five years. After this, parts need replacing, and the best of the machine's life is ended. Here is where I consider it more profitable to buy a new machine than adding new parts to the old one.

—C. L. HENRY, *England.*

## THE · NEXT · TOPIC

**Putting One Over on the Builder**

ADVANCE QUESTION

*Al finds a man trying to blame a broken toolblock on a poor casting, so as to make the builder replace it. Ed says it is often done, but Al won't have it. Is he too severe?*

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### Putting Color on the Machinery

A CHEERFUL place to work in results when a shop adopts light colors for machinery and interiors. Since the men would appreciate this, it can be expected that the machinery would be kept cleaner and in better running order. Furthermore, the greater amount of light available from the same source of illumination, through better reflection, would tend to speed up the work and bring about better workmanship.

—F. E. CLARKE.

IN THE average machine shop too much time would be required to keep bright colored machines clean. Whereas a brush, or a piece of none too clean waste, and possibly a little gasoline, will serve to keep the machine finished in black looking spic and span, it would require quite a bit more time and effort to keep a bright colored machine looking as well. Even a machine finished in gray requires much more time and effort than one in black. It finally resolves itself into the question of whether or not the management is willing to stand the expense of keeping the machines clean.

—C. H. LATTNER.

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### Do Brains or Beef Count Most?

A FOREMAN with a good understudy need not be on the job every day to keep things running smoothly. The up-to-date foreman has found that the

elimination of idleness is more effective in increasing production than the speeding up of either men or machines. He concentrates his efforts on fixing responsibility and getting those working with him to understand the execution of their duties. As a result the men will not run to him with every little thing. This encourages them to act on their own initiative and develops their judgment. He knows he cannot be right there every minute, and a number of little things will come up which the men can decide for themselves if they know just what the foreman is aiming at. Of course, excessive absence is detrimental to shop efficiency and should not be tolerated. —G. H. GUNN.

JUST as overhead on a given job is often a quantity that cannot be measured accurately, so it is with this question of the foreman and the good understudy. A vacation represents an absence that can be planned for in advance, and which has a definite beginning and a definite ending. Poor health, however, strikes unexpectedly and no matter how well trained and capable the understudy there is a definite loss in continuity of effort. Many questions will tend to be postponed in the hope that the foreman will be in tomorrow or the next day. Brains and good health go together and there is no reason why the concern should not get both, within reason, in return for its investment. —PERCY H. GARRETSON.

### Monthly Checks on Workmen's Ability

I KNOW personally of a case where one of our fastest workers suddenly slumped without apparent reason. Knowing his past record, I knew there was something unusual back of the lapse. Finally I had a talk with him and learned that his child was critically ill. Consequently, it was difficult for him to keep his mind on his work.

If a new foreman had taken my position during this employee's seeming slump, and if there were no records to show that ordinarily he is a first-class speedy worker, the chances for his being laid off would have been far greater than his chances for promotion.

—HUGH M. MITCHELL.

THERE is only one method, in a large concern, for knowing the qualifications of every individual employee, and that is a monthly efficiency report. The foreman should fill out a card covering the men's production, promptness, lost time, sickness, conduct, and adaptability. In this manner the management is able, at any time, to select the best men for promotion, raise in salaries, or, if necessary, to be laid off. A firm cannot be too particular as to the personnel of its employees, and a constant check gives complete data on the entire payroll. —GEORGE BENDON.

### Vacations as a Bonus

SO, AL would have a select few take a vacation and leave the rest of the force to work out their own salvation! The fundamental idea of a vacation itself must not be lost sight of. An employee who has been with the company for a reasonable length of time is a factor whose upkeep is necessary for efficiency. It is to the interest of the employer that each employee take at least one week of rest, this week to be paid for by the company. An hourly man is as valuable to him as an office employee. He should see to it that the workmen "go in drydock" so that they may be better able to withstand the ravages of the industrial elements. Successful industry is no longer machinery and methods; it is machinery, methods, and men. —J. HOMEWOOD.

IT MATTERS a great deal to a man to be able to point with pride to the fact that his company is modern enough to see the benefits of granting the worker a vacation. It increases his loyalty and efficiency, and decreases labor turnover. However, I believe that vacations should not be optional with a cash bonus, because the men will invariably take the cash bonus.

Vacations can be given for special service without interfering with the regular work. But this bonus should be in addition to the regular vacation period, and should not comprise the entire period granted by the company.

—S. KUPPER.

### Helping the Firm Make Sales

THE proper thing for Roberts to have done when he heard of the need of equipment at the other mine was to see the manager and explain the merits of his company's product. This he could do in a way that the salesman was hardly fitted to do. By going into detail he made a good impression on the manager, and after a demonstration won the order for the Farwell Works. It meant a quick sale, and no time could be lost in trying to locate the salesman.

Did his firm censure him for the sale? By all means, no. They were only too glad of the order. In fairness to all parties, the company should divide the commission between the salesman and Roberts.

—WILLIAM W. BARNETSON, *Canada.*

### Should He Report Another's Error?

THE foreman is the key man in his department. If the workers hear that a case of this nature goes unreported, laxness may result on the part of the men in the department. The foreman comes into close contact with the workers, and it is from him that they obtain their impression of the management. The foreman, therefore, is the one man who ought to report a case of this nature to the head of the department responsible, so that the trouble may be remedied.—R. D. GUNNIS.

AS IT stands now, Ed's foreman friend is "in the soup" properly because he has wilfully hidden equipment during inventory. In the company's eyes this is a serious offence, for it shows him up as not being on the level. There seems nothing else for Ed's friend to do but to keep on hiding it or talk it over with the M.M., and the last would be the best thing to do.

As for the operator, his case should be investigated to find the cause of his fear. Further, he should be instructed to ask for help whenever he is in doubt. However, if he is a persistent offender his services should be dispensed with. —G. P. BROMMAGE.

# *Tremendous Trifles in the Metal Stamping Business*

By Robert I. Miner

*Consulting Engineer, The Youngstown Pressed Steel Company*

## Grease Cups on Smoke Stacks

GATHERING up the order, blueprints, estimate, and report, the sales manager proceeded to the engineering office to see the chief.

"Jim, our efforts as educators are not so bad—here's one piece of business that looks good to me!"

"Is that so?" returned Jim, folding his arms. "Must be good news on tap, Charles."

"You remember well enough how you helped Scarey tuck in the loose ends about a month ago, when he got that gear-case order? I've got to say that he has handled this order to the queen's taste!"

Jim spread out the blueprints and estimates. "Does look as if he had everything here. But why get me in

on it?" he queried. "Isn't everything like it was when I went over it with you and Scarey last week?"

"Don't know as there is any hitch, but Art asked me to have you give it the once-over before he sent it to the shop. There was something about that blueprint that interested him in particular, now that I think of it."

Jim was now busily tracing out the possibilities shown by the white lines and the figures. "Hm, Art is perfectly right—there wouldn't be any use in sending this animal to the shop until we curry it a little.

"What's the limit for on this dimension at 'A?' We know that the halves of this contraption are forced inside of a tube, and we know that this end will be sprung into place in the assembly. Even if the outside were finish machined, these tolerances would be impractical, and wholly unnecessary. Why, in forming, that thin metal is going to spring a sixteenth or more, depending on the hardness of each blank. Send a dimension like that to the shop, and they will come running in here to ask us if we aren't putting grease cups on smoke stacks now! Plus 0.001 in., minus 0.000 in.—can you beat that! Hm!—I get the picture now—we figured that job from the sketches that their engineer sent in here, didn't we? I know Joe Marks pretty well. His first letter said he intended giving us the important dimensions, and would leave it to us to adapt the scheme to the best stamping practice. Who made these drawings?

"Yeh—here's some more funny stuff! See that note, at 'B?' *This surface must be perfectly flat.* Tell me, Charlie, what *is* flat in a piece of metal like that, half as big as the top of this disk, and thin as a half dollar?

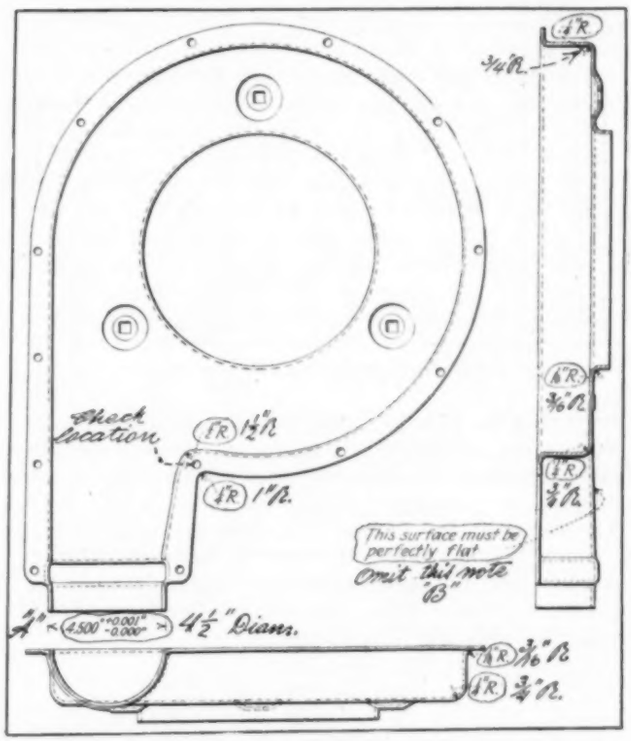
"Wow! Look at the radii in these corners—they'd tear a sheet of rubber! Looks like a job for the old yellow pencil," and Jim started to operate. "Charlie, I've been in this game fifteen years and up, and you know that when I say 'no can do,' I mean *in a commercial way.* These things, even if possible, would not make the parts one bit better—no machining is saved—the work moves no easier on the assembly line."

"How is it going to look to go back at them and say we can't make it the way they want it?"

Jim was "pawing" over the papers again. "Must be a report from Scarey in this file—yep, here 'tis. Without reading it, I'll bet you right now the kid was wised up enough to spot some of these things. You read it."

Charles grabbed the report, and read. "When I arrived at Blank Company's office, I was told that they had the order all written for me. The engineer was called out of town but the draftsman told me that he had put in a few dimensions and notes himself that he thought would be helpful. Although they were not on the sketches that we had when we estimated on the job, I took them along knowing we would make our own working drawings. Some of the radii look rather small, and I don't see as the note about flatness is going to mean anything. Consequently I told him we would accept the job with the understanding that any additions made since the estimate would naturally be subject to revision by our engineers. You will see that the order is written with that note on it."

"Well, Jim, I'm sure getting a whole lot more cheer out of the pack than I could hope for after that yellow




pencil got into action. Guess Scarey was on his job, after all."

"Right-o! And its a peach of a job for us to have—makes a beautiful stamping—and boy, its going to doll up their product and save them so much money, that they will tell the world about it! I'll promise to have Joe Mark's approval on them, before we get very far along with the tools. You see, Charlie, it won't be any trouble a-tall. Joe and I started out together in this business, and Joe knows the game as well as I do."

Jim chuckled, and started to read his morning mail.

# Finding the Developing Angles on Circular Form Tools

By Fritz L. Keller

UP TO DATE, I have never seen a method for figuring the developing angle on a circular form tool to which the angle should be turned and ground to give the correct impression angle after it has been cut below center. Whenever it was required to make an accurate angle, it was necessary either to cut the circular form tool on center or use a so-called dovetail forming tool or any other taper turning tool. It has also been stated in some textbooks that the angle on a circular form tool should be turned and ground such a distance below center that the circular form tool, when finished formed, will be cut out to be on center of the work. This method is not very practical, however, as the master tool which is to shape the circular form tool will chatter and give further difficulties in the grinding operation.

In Fig. 1 an exaggerated case of a circular form tool cut below center is shown so as to indicate how the tool changes its angle as the distance $C$ below center is increased. In the example, $A = \frac{1}{4}$ in. and $B = \frac{5}{16}$ in. Since the width $W$ of the angle remains the same, it is

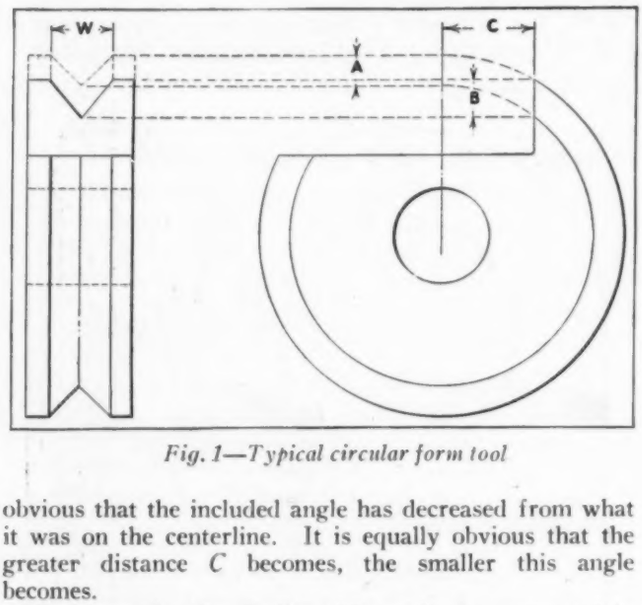



*Fig. 1—Typical circular form tool*

obvious that the included angle has decreased from what it was on the centerline. It is equally obvious that the greater distance $C$ becomes, the smaller this angle becomes.

The formulas for finding this angle are presented in the chart, Fig. 2. Their use can be made clear by an example. Let us assume that it is required to find the angle for a circular form tool to cut a bevel gear blank having the following dimensions:

$$\begin{aligned} \alpha &= 42°48' \\ N &= 0.171 \text{ in.} \\ \beta &= 44°9' \\ O &= 0.314 \text{ in.} \\ A &= 3.000 \text{ in.} \\ B &= 1.500 \text{ in.} \\ C &= 0.312 \text{ in.} \end{aligned}$$

In order to find the developing angle $O$, it is necessary to find some of the minor values, placed upon the chart:

$$D = \sqrt{B^2 + C^2} = \sqrt{1.5^2 - 0.312^2} = 1.467 \text{ in.}$$

$$E = N \cot \alpha \quad = 1.71 \cot 42°48' = 0.1836 \text{ in.}$$

$$F = D + E = 1.467 + 0.1836 = 1.6506 \text{ in.}$$

$$P = \sqrt{F^2 + C^2} = \sqrt{1.6506^2 + 0.312^2} = 1.680 \text{ in.}$$

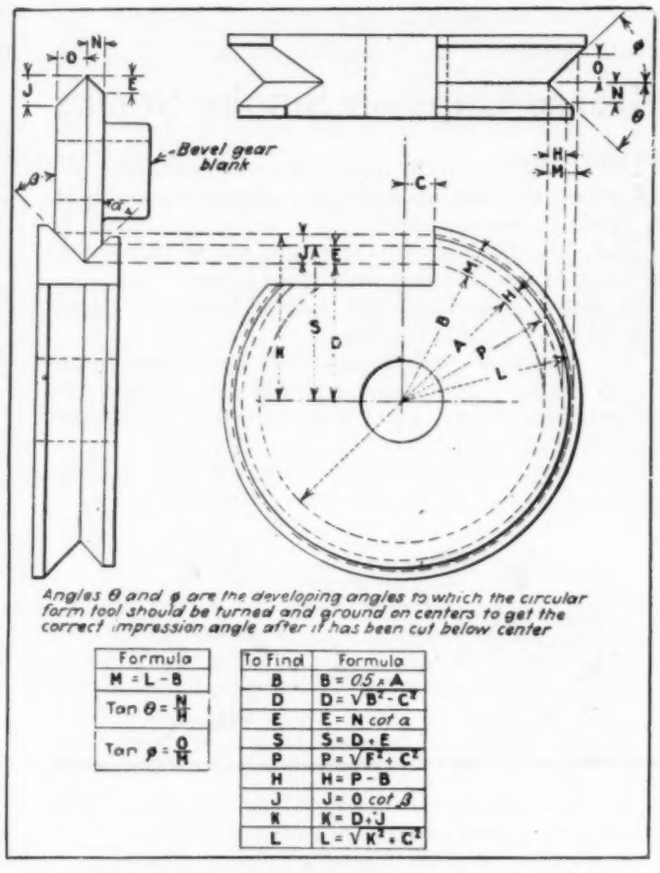

Bevel gear blank
Angles θ and φ are the developing angles to which the circular form tool should be turned and ground on centers to get the correct impression angle after it has been cut below center
Formula
M = L - B
Tan θ = N/H
Tan φ = O/H
To Find
Formula
B
B = .05 x A
D
D = √B² - C²
E
E = N cot α
S
S = D + E
P
P = √F² + C²
H
H = P - B
J
J = O cot β
K
K = D + J
L
L = √K² + C²

*Fig. 2—Chart for finding the developing angles on circular form tools*

$$H = P - B = 1.680 - 1.500 = 0.180 \text{ in.}$$

$$\text{Tan } \theta = \frac{N}{H} = \frac{0.171}{0.180} = 0.950$$

$$\theta = 43°32'$$

The developing angle $\phi$ is found in a similar manner:

$$S = O \cot \phi = 0.314 \cot 44°9' = 0.3234 \text{ in.}$$

$$K = D + S = 1.467 + 0.3234 = 1.7904 \text{ in.}$$

$$L = \sqrt{K^2 + C^2} = \sqrt{1.7904^2 + 0.312^2} = 1.8175 \text{ in.}$$

$$M = L - B = 1.8175 - 1.500 = 0.3175 \text{ in.}$$

$$\text{Tan } \phi = \frac{O}{M} = \frac{0.314}{0.3175} = 0.988$$

$$\phi = 44°40'$$

Indexing pins are made both straight and taper according to the idea of the designer. Those who advocate the taper pins feel that the wedging action of the taper assists in obtaining accurate location, and also holds the piece more firmly. Others prefer the straight indexing pin, because of the possibility of small chips wedging between the inclined surfaces of the taper pin and thereby destroying the accuracy of the indexing feature. With the straight pin, any chips that may have lodged on the pin are brushed off as it enters the hardened bushing.

# Design of Railroad Shops and Terminals

## Conclusions reached by a committee of the Mechanical Division of the American Railway Association, and points brought out in discussing the report

MAXIMUM utilization of modern locomotives cannot be obtained unless the engine terminal and the facilities provided in connection with it are designed for the rapid and efficient handling of present-day locomotives. The acceleration of trains over the road by improvements in grade and road bed, double tracking and signals, improved dispatching and other details of operation, may in a large measure be offset by delays to motive power at inadequate terminals. A typical layout is proposed, the portions relating to the handling of locomotives in the roundhouse and the repair shop being illustrated herewith. This layout proposes certain dimensions applicable to handling modern steam locomotives in general, and is not intended for terminals handling extremely large or very small locomotives, such as Mallets or suburban engines. Additional consideration must be given by individual railroads in order to meet special and local conditions required by them. The suggested layout is for a terminal dispatching from 75 to 90 locomotives every 24 hours. It is based on three locomotives per stall for each 24-hour period, excepting those stalls used for engines held for heavy roundhouse repairs. The plan calls for a total of 30 stalls, five of which are for repairs, and four of the five are provided with drop pits.

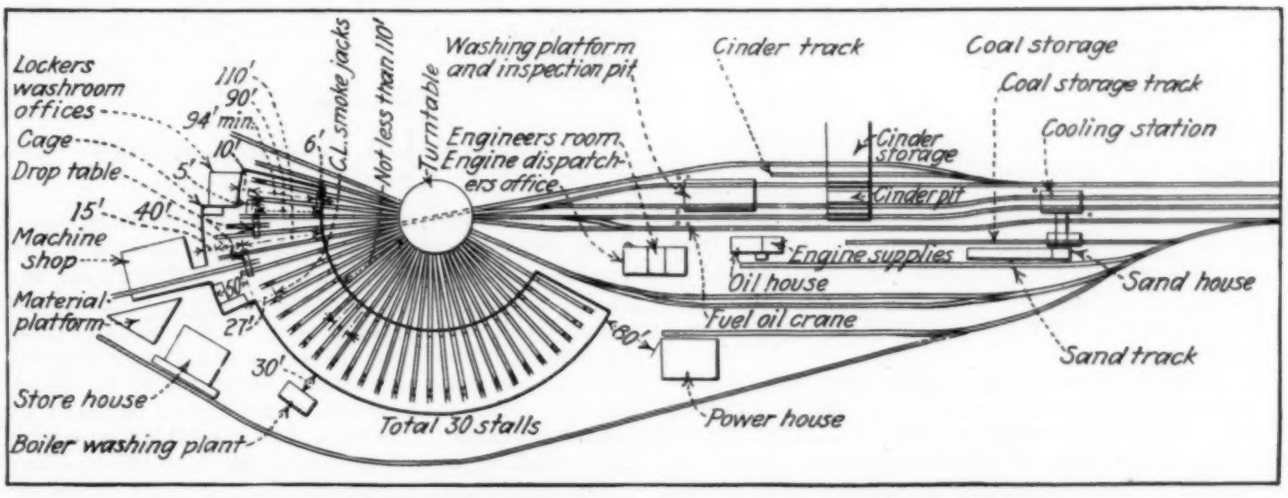
The turntable should have a minimum length of 100 ft., and should be of the three-point suspension type, in view of eliminating the necessity for spotting and balancing locomotives before turning. The table should be driven by power units at each end, operated simultaneously from dual controls located on both ends, and interlocked. A dead engine puller, located on and operated from the table, may be installed where local conditions require it. When construction and drainage will permit, a deck table with the girders below is recommended, instead of the through-girder type with the shallow pit. A walkway on the table on each side of the engine is desirable. The turntable pit should be of concrete and provided with adequate drainage.

The engine house should be of as nearly fireproof construction as possible, and concrete with steel framing is recommended. None of the steel framing should be exposed to the action of gases, and where it cannot be fully protected, reinforced concrete is to be preferred. Dirt, cinder, or brick floors are unsuitable for trucking, and while plain concrete is very good, it is not easy to repair. A floor having a concrete base is therefore recommended, the top to be covered with a more plastic material, bearing in mind that it must be waterproof and strong enough for heavy trucking. The floors can be slightly crowned, with the slopes toward the pits, so as to secure easy drainage.

The minimum length of stalls should be 115 ft. from the inner to the outer engine wall. A minimum of 110 ft. from the turntable to the inner wall should be for movement of locomotives on the tracks behind locomotives standing in the house, without interference with the continuous operation of the turntable, and to eliminate the necessity for frogs. The minimum side clearance of inner-wall doors should be 14 ft. between the faces of the posts. Overhead clearance should not be less than 17 feet.

Each stall should be provided with an engine pit 94 ft. long and as wide as construction will permit, approximately 4 ft. A space of 15 ft. should be allowed in front of the pit, and approximately 6 ft. behind it. In order

Presented at the ninth annual convention of the association, June, 1928.




*Recommended design for locomotive roundhouse, machine shop and material platform*

to facilitate the passage of trucks, the tracks should extend a minimum distance beyond the fronts of the pits. The pits should be free from obstruction, and steam, water or electric connections are seldom necessary. It is vital, however, to provide substantial jacking foundations on each side of the pits.

Two drop tables, each serving two tracks, should be provided as shown in the diagram. They should be of the single-wheel type, and located opposite from the leads in order to facilitate placing dead engines on them. Both should be located at a sufficient distance from the inner wall, so as to allow the dropping of wheels from any locomotive while the doors are closed. The table nearest the door should be of heavier capacity than the other for dropping the driving and trailing wheels. The other drop table may be lighter, and so accommodate the engine truck, trailer, and tender wheels only, if desired. If local conditions warrant, it might be well to install a table of sufficient size to permit the lowering of four-wheeled trucks as units. The drop table arrangement is not intended for general repairs or for backshop work, as it is assumed that such work will be done in the machine shop. Two of the drop table tracks should be considerably extended toward the machine shop, in order to give a more flexible arrangement.

The machine shop should be adjacent to the drop-table bay, and connected to it by a large passageway, to separate the two buildings and increase the light and ventilation. It is not thought desirable to locate machine tools in the roundhouse proper, where they are subject to the action of the roundhouse gases. This separation will aid materially in maintaining proper heating and ventilation in the machine shop. The wheel track should run entirely through the machine shop to provide a means of moving wheels from the drop pit to loading tracks outside. It is not necessary to provide the shop with an overhead traveling crane, but it should be preferably supplied with jib cranes and small monorail hoists, conveniently located. The following machine tools and equipment are suggested:

Lathe for engine-truck and tank wheels
32-in. heavy-duty lathe
20-in. lathe
8-in. lathe
5-ft. radial drill
21-in. upright drill
45-in. vertical boring mill
36x36x120-in. planer
32-in. crank shaper
2-in. single-head combination bolt and pipe threading machine, ½ in. to 2 in.
High-speed hacksaw
50-ton hoisting and bending press
Tool grinders
Power hammer
Small flanging clamp

Casting platforms, material storage, wheel tracks, and storeroom should be located near the machine shop. Concrete roadways from these points to the machine shop and roundhouse, should be provided for movement of trucks and cranes. The storehouse and machine shop should be served by a switch track, and hoists should be provided for loading and unloading wheels. Elevated unloading platforms will facilitate handling materials into the storehouse.

A traveling crane in the roundhouse proper is not recommended, because, in order to install a traveling crane, it would be necessary to construct a building considerably higher than is otherwise necessary, and also to install smoke receivers with a down-draft system instead of smoke jacks. This is an expensive construction which the committee did not feel was justified in most cases. The proposed layout provides for a passageway through the roundhouse, drop-table bay and material yard for the operation of a crane-type truck equipped with a power unit to give 24-hour service. Smaller power trucks without the crane feature should be provided as found necessary. The column construction should be designed to allow for proper movement of the truck cranes.

The roundhouse should be designed to provide for a maximum of daylight consistent with safe construction. This is stressed because of inadequate daytime lighting near the inner wall, especially when the doors are closed. Two-lens lights should be located on the outer circle wall and single-lens lights on the inner circle wall. These lights should be located approximately 13 ft. above the floor line, and between the stalls, so as to light the spaces between locomotives. On each supporting column at the side of the pit, and about 8 ft. above the floor, there should be a 100-watt lamp covered by a deflector, and goose-necked, so as to throw the light directly on the rod and motion work of the locomotives. The conduit should be located in the floor, and the lights should be below the gas and moisture line, which would help to reduce the cost of maintenance. In addition to the lighting circuit, provision should be made for power and electric welding circuits, if they are to be used. Electric welding outlets should be provided between every second stall and located on posts or columns, so as to serve the adjacent tracks.

Numerous suggestions were made, such as having pneumatic tube connection between the inspection pit and the general foreman's office, in order to speed up the movement of engine reports. The location of the wash and locker room was also criticized on account of its effect on the lighting. The use of a gantry crane over the cinder pit, such as used at Ogden, Utah, and other places, was also suggested.

Types of drop pits, comparative merits of hot air and low-pressure steam coils for heating, and the materials to be used in roundhouse construction were also subjects on which numerous opinions were expressed. There was, however, little criticism in regard to the list of machine tools given, except that an 8-in. lathe was thought to be a trifle small, and the omission of a driving wheel lathe was mentioned.

One member stated that it is the practice of some roads to divide the house into sections, as a means of fire protection and on account of drafts in winter. The objections to this are loss of space and greater difficulty in working along the locomotives on each side of the fire wall.

## Closing Up Porous Castings

By Gordon Brown

PHENOL resin varnishes and enamels, such as Bakelite varnish, can be used effectively in closing the pores of porous castings, and the method has been applied particularly to aluminum castings, such as gas engine crank cases. The process in general is to pour the Bakelite enamel into the casting and force it into the pores by means of air pressure, or simply by means of gravity. Then after draining, the casting is baked to harden the enamel. At the end of the baking operation, the varnish or enamel is completely insoluble in water or ordinary solvent, is infusible, and is entirely unaffected by oil.

# Alignment Chart for Designing Valves

By Hans Goldschmidt
*Doctor of Engineering*

WHEN designing valves, it is necessary to secure a constant velocity of the fluid through the parts, and in order to secure this condition equal areas must be provided at all sections. A common method of determining the valve stroke when bore of the port and valve shaft diameter are known is to estimate its length, compute the area through the valve seat which is that within the section $d$, Fig. 1, and correct the stroke until the desired area is obtained. This method is cumbersome and can be eliminated by the use of the formula that will be developed.

Referring to Fig. 1 the quantities may be designated as:

$s$ = stroke
$d_1$ = diameter of port
$d_2$ = valve shaft diameter
$d_3$ = diameter through valve
$d_4$ = opening between valve seat and chamber
$\alpha$ = base angle of valve seat.

Given $d_1$, $d_2$ and $\alpha$
To find: $d_3$ and $s$
Referring to Fig. 1, and since all areas through valve are equal:

$$\frac{\pi}{4} d_1^2 = \frac{\pi}{4} \left( d_3^2 - d_2^2 \right)$$

$$d_3 = \sqrt{d_1^2 + d_2^2} \qquad (1)$$

When used in connection with the alignment chart, Fig. 3, the formula will read:

$$d_3^2 = d_1^2 + d_2^2$$

To find $s$; referring to Figs. 1 and 2:

$$\frac{\pi}{4} d_1^2 = \pi d_4 (d_3 - d_4 \sin \alpha)$$

or expressed in the form of a quadratic

$$d_4^2 \sin \alpha - d_3 d_4 - \frac{d_1^2}{4} = 0$$

$$d_4 = \frac{d_3 \pm \sqrt{d_3^2 - d_1^2 \sin \alpha}}{2 \sin \alpha} \qquad (2)$$

The solution obtained when using the + sign has no significance in this discussion.

Referring to Fig. 2:

$$s = \frac{d_4}{\cos \alpha} \qquad (3)$$

$$s = \frac{d_3 - \sqrt{d_3^2 - d_1^2 \sin \alpha}}{2 \sin \alpha \cos \alpha} \qquad (4)$$

But $2 \sin \alpha \cos \alpha = \sin 2 \alpha$
and $d_3 = \sqrt{d_1^2 + d_2^2}$

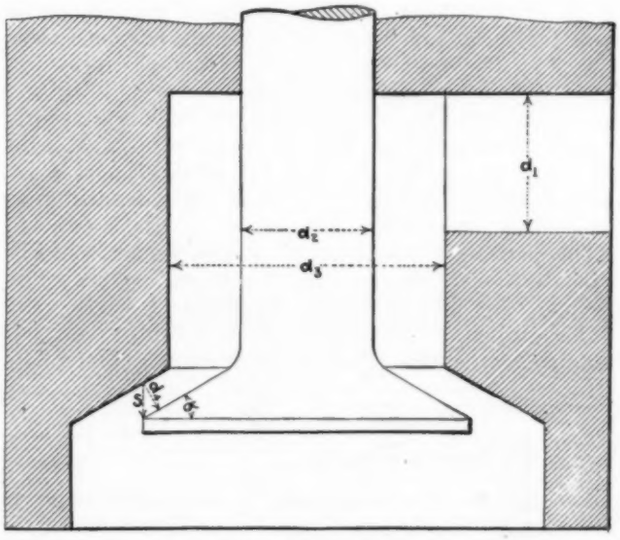
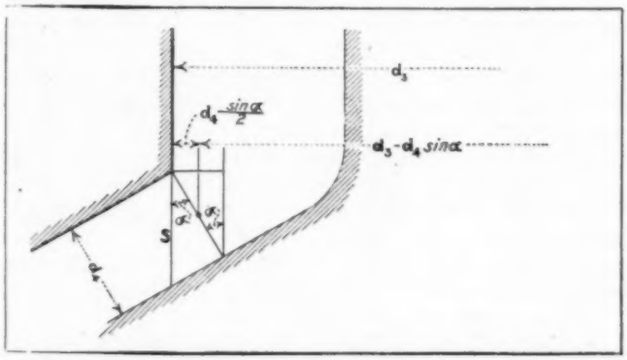



*Fig. 1—Cross-section of valve*



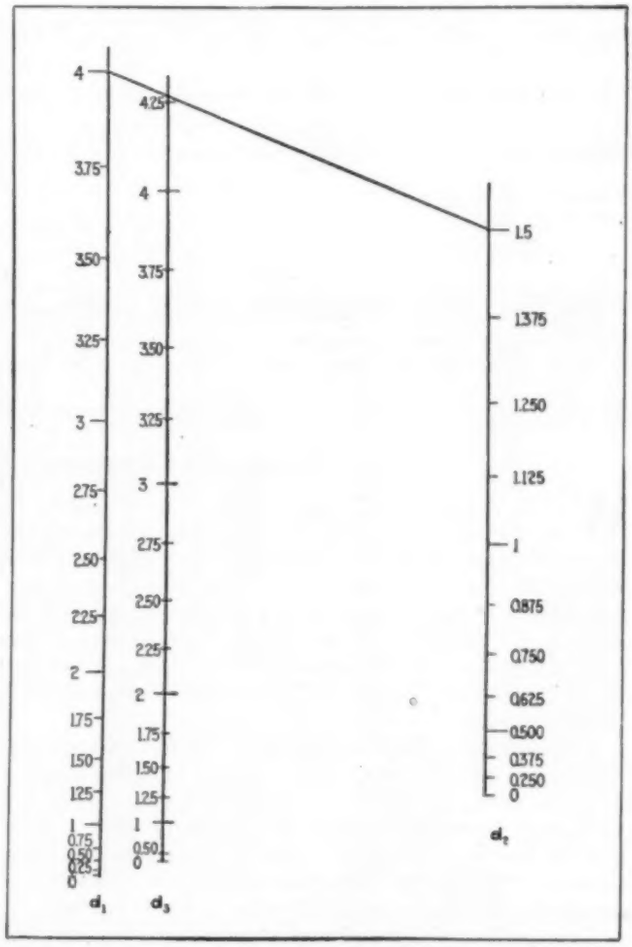




*Fig. 2—Detail of valve lift. Fig. 3—Alignment chart for determining $d_3$, given $d_1$ and $d_2$*

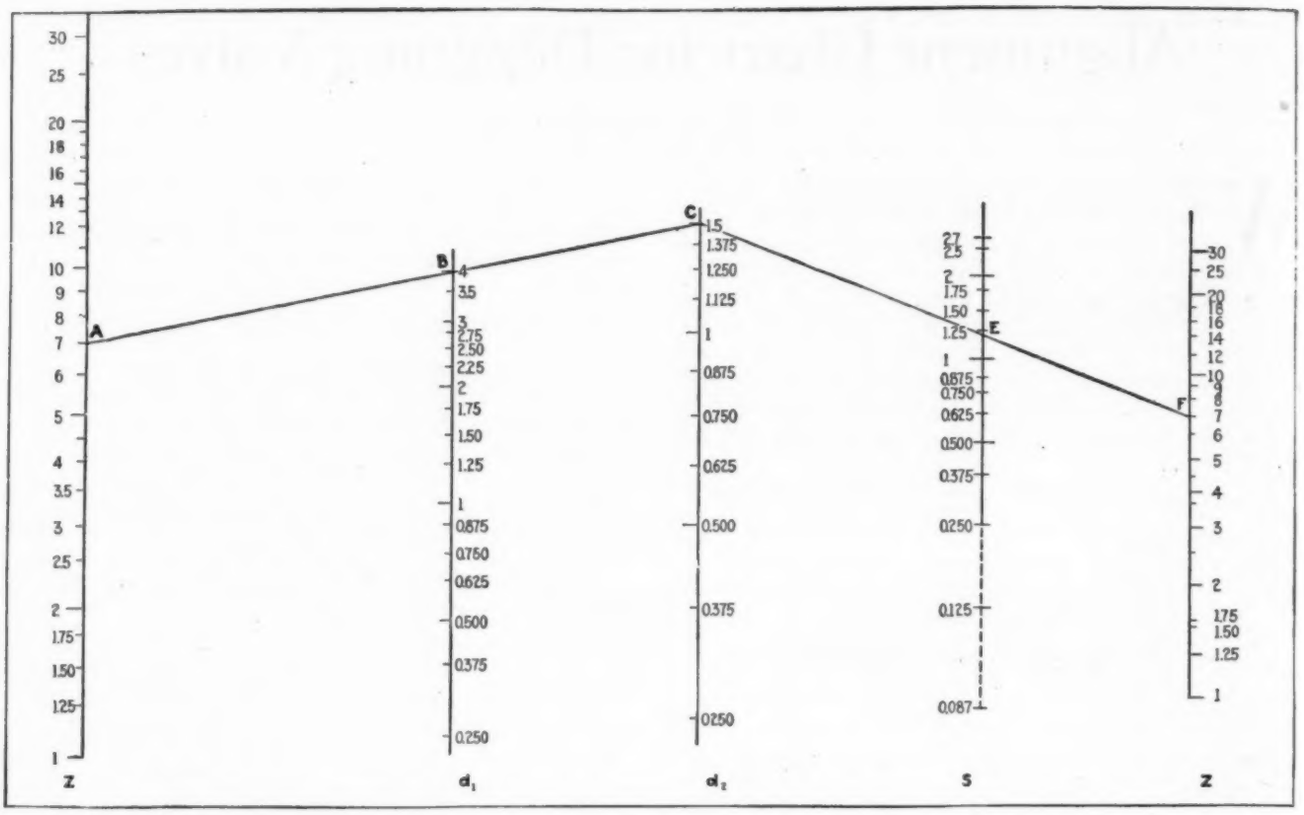



*Fig. 4—Alignment chart for determining stroke s of valve shaft; given $d_1$, $d_2$ and $\alpha = 30$ degrees*

Therefore, $s = \dfrac{\sqrt{{d_1}^2 + {d_2}^2} - \sqrt{{d_2}^2 + {d_1}^2\,(1 - \sin \alpha)}}{\sin 2\,\alpha}$

If the angle $\alpha$ is set at 30 deg. and the ratio of the diameters of the port and valve shaft is $z = \left(\dfrac{d_1}{d_2}\right)$, the formula can be simplified to

$$s = d_2 \left(\frac{\sqrt{z + 1} - \sqrt{0.5\,z + 1}}{0.866}\right)$$

This formula may be used in the alignment chart, Fig. 4, which gives the length of stroke for any combination of $d_1$ and $d_2$. For example let $d_1 = 4$ in. and $d_2 = 1\frac{1}{2}$ in. Draw the line segment $BC$ connecting these two values on their respective scales, and extend it to $A$ on the $Z$ scale at the left. From the equivalent value of $Z$ on the right-hand $Z$ scale at point $F$ draw a line to $d_2 = 1\frac{1}{2}$ in., at $C$. This line will intersect the scale $S$ at the point $E$, and the value of $s = 1.23$ in. The chart should not be used for strokes under $\frac{1}{4}$ in., as the resistance to the flow of fluids through small areas changes very rapidly.

The diameter in the valve, $d_3$, may be found from Fig. 3 by drawing a line between the known values of $d_1$ and $d_2$. The intersection on $d_3$ scale will give a value of the diameter of the valve which will insure an area equal at this point to those at the other two points.

## Consumer Demand Guides Foreign Trade

WITH the gradual spread of American products of all kinds, the pressure of potential consumer demand is wearing down many arbitrary limitations and barriers set up to exclude them. That this process will take time, but can be materially expedited if headway is made in the adoption of the Geneva Convention, is the belief expressed by Dr. Julius Klein, Director of the U. S. Bureau of Foreign and Domestic Commerce, in a recent address.

The British rubber restriction scheme, under the Stevenson plan, is a profound example of what happens to a trade barrier which is maintained too long in the face of an increasingly powerful current of natural commercial forces. The final consumer weapon was instituted in 1926 by the American pool, which represented practically all of the large consumers in this country.

This pool established direct dealing with the planters and others in the East, thus circumventing the brokers and commission house operations in London. The power of such consolidated buying was demonstrated during the May-July restriction quarter of 1926, when the price of rubber was averaging just about the figure stipulated in the scheme as being necessary to maintain 100 per cent of the exportable allowance from the plantations for the succeeding quarter. Manufacturers supported the market during the closing days of July, holding the price at just about the stipulated level, and, as a result, the export allowance for August-October remained at 100 per cent, then at 80 per cent, instead of 70 for the next three months, and 50 per cent instead of 60 for the additional three months. The higher exports during 1926-1927, thus brought about largely by the action of the American rubber pool, caused an addition of 40,000 tons to the available supply of new rubber. An outraged customer world had resorted to devices that will ultimately be completely effective.

# Incentive Wage System *in the Tool Room*

By G. P. LONGABAUGH

*Time Study Supervisor, Large and Small Tool Department*
*Westinghouse Electric and Manufacturing Company*

**Doubts are often expressed of the advisability of employing wage incentives in tool work, but the author of this article describes a system that is successful**

TIME study and a wage incentive system have been found to be practical in the handling of all classes of tool work in the tool department of the Westinghouse Electric & Manufacturing Company. When first introduced, there was a question as to how it would be received by this class of high-grade workmen, but in actual practice it has been found that the toolmaker takes a lively interest in the system, and it has been through co-operation between the toolmakers and the time-study men that the system has proved a success. The first requisite of such a system, of course, is a group of time-study men and estimators thoroughly experienced in tool work, and thereby capable of gaining the respect and co-operation of the toolmakers.

When an order for a jig or fixture is presented to the production department, it is accompanied by four blueprints. The production department then gives it an order and a serial number, and a date of promised delivery. From the production department, one print is sent to the time-study department and three prints to the shop. For illustration, a typical small drill jig job is shown in Fig. 1. From this print, a time-study man lays out an

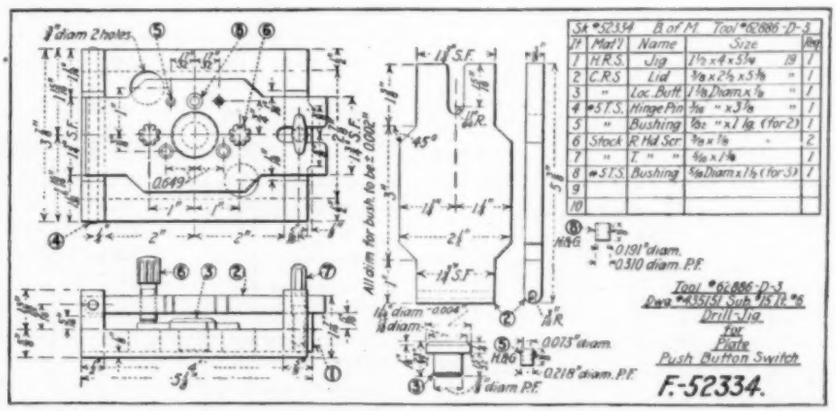



*Fig. 1—Typical layout drawing of a drill jig to be made under the bonus system. The information given is made as complete as possible*

*Fig. 2—Operation sheet for making the drill jig shown on the drawing. This sheet is made up in the time-study department by a man who is experienced in tool making and familiar with the methods employed in the tool-room. It forms a guide for all work in connection with making the jig, and must be followed by the toolmaker*

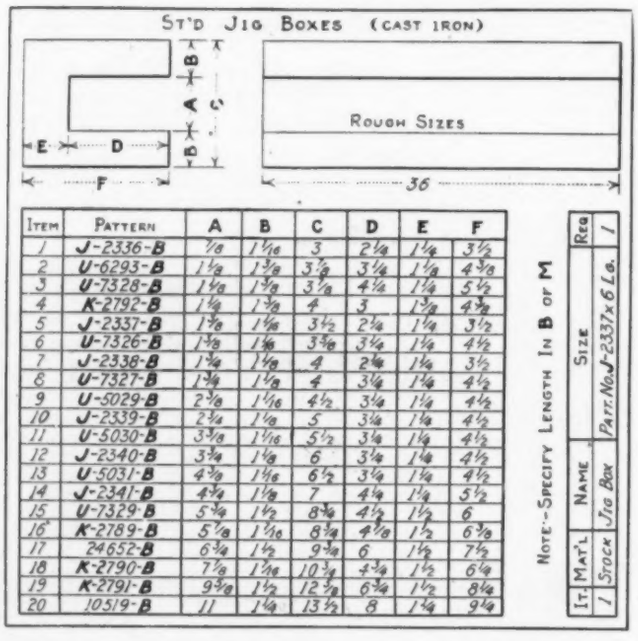
69 BLANCHARD GRINDER — GRIND FEET OF PATTERN JIG BOXES

| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| A) Grd. 1st side | 250 | 333 | 417 | 500 | 583 | 667 | 750 | 833 | 917 | 1.00 |
| B) " add. " parallel | 250 | 333 | 417 | 500 | 583 | 667 | 750 | 833 | 917 | 1.00 |
| C) " " " sq.1 dir. | 375 | 500 | 625 | 750 | 875 | 1.000 | 1.125 | 1.250 | 1.375 | 1.500 |
| D) " " " " 2 " | 470 | 625 | 781 | 940 | 1.095 | 1.250 | 1.406 | 1.560 | 1.720 | 1.870 |

A) Based on length of surface ground
B) " " " " "
C) " " height from chuck
D) of surface ground

NOTE:-FOR C.I. USE 75% OF THE ABOVE VALUES
ADD 50% TO ABOVE VALUES FOR ANGULAR FEET
CAST STEEL - ADD 10%
BUILT UP JIGS - ADD 15%

*Fig. 3—Typical data card kept on file in the time-study department. These cards are made up from the accumulated information resulting from time-studies and experience on various jobs. They are filed by number for ready reference and they save much labor in estimating times on new jobs*




| Item | Pattern | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| 1 | J-2336-B | 1/8 | 1 1/16 | 3 | 2 1/8 | 1 1/4 | 3 1/2 |
| 2 | U-6293-B | 1 1/8 | 1 3/8 | 3 3/8 | 3 1/4 | 1 1/8 | 4 3/8 |
| 3 | U-7328-B | 1 1/8 | 1 3/8 | 3 3/8 | 4 1/4 | 1 1/4 | 5 1/2 |
| 4 | K-2792-B | 1 1/8 | 1 3/8 | 4 | 3 | 1 3/8 | 4 3/8 |
| 5 | J-2337-B | 1 1/8 | 1 1/8 | 3 1/2 | 2 1/4 | 1 1/4 | 3 1/2 |
| 6 | U-7326-B | 1 1/8 | 1 1/8 | 3 3/8 | 3 1/4 | 1 1/4 | 4 1/2 |
| 7 | J-2338-B | 1 1/8 | 1 1/8 | 4 | 2 1/4 | 1 1/4 | 3 1/2 |
| 8 | U-7327-B | 1 1/8 | 1 1/8 | 4 | 3 1/4 | 1 1/4 | 4 1/2 |
| 9 | U-5029-B | 2 1/8 | 1 1/16 | 4 1/2 | 3 1/4 | 1 1/4 | 4 1/2 |
| 10 | J-2339-B | 2 1/8 | 1 1/8 | 5 | 3 1/4 | 1 1/4 | 4 1/2 |
| 11 | U-5030-B | 3 1/8 | 1 1/16 | 5 1/2 | 3 1/4 | 1 1/4 | 4 1/2 |
| 12 | J-2340-B | 3 1/8 | 1 1/8 | 6 | 3 1/4 | 1 1/4 | 4 1/2 |
| 13 | U-5031-B | 4 1/8 | 1 1/16 | 6 1/2 | 3 1/4 | 1 1/4 | 4 1/2 |
| 14 | J-2341-B | 4 1/8 | 1 1/8 | 7 | 4 1/4 | 1 1/4 | 5 1/2 |
| 15 | U-7329-B | 5 1/8 | 1 1/2 | 8 1/8 | 4 1/2 | 1 1/2 | 6 |
| 16 | K-2789-B | 5 1/8 | 1 1/16 | 8 1/8 | 4 1/8 | 1 1/2 | 6 1/8 |
| 17 | 24652-B | 6 1/4 | 1 1/2 | 9 1/8 | 6 | 1 1/2 | 7 1/2 |
| 18 | K-2790-B | 7 1/8 | 1 1/8 | 10 1/8 | 4 1/4 | 1 1/2 | 6 1/4 |
| 19 | K-2791-B | 9 1/8 | 1 1/2 | 12 1/8 | 6 1/4 | 1 1/2 | 8 1/4 |
| 20 | 10519-B | 11 | 1 1/4 | 13 1/2 | 8 | 1 1/4 | 9 1/4 |

NOTE-SPECIFY LENGTH IN B OR M

| Req | 1 |
|---|---|
| Size | Patt. No. J-2337 x 6 Lg. |
| Name | Jig Box |
| Mat'l Stock | 1 |

*Fig. 4—Layout sheet of standard drill-jig boxes filed in the time-study department. This sheet is typical of others covering dimensions of various standard parts which can be drawn from the storeroom or made up from standard patterns*

operation sheet, shown in Fig. 2, taking into consideration all shop operations from the interpretation of the drawing to the final fitting and assembling of the jig. The numbers which he assigns to the operation refer to numbered cards in the time-study department files, from which he has taken his data on the time allowances to be made. These data are the accumulation of previous experience, and from time studies on other jobs of a similar nature. A typical numbered card is shown in Fig. 3. The numbers heading the columns on this card in turn refer to the items on the file drawing in Fig. 4. This drawing is part of the time-study department's accumulated records, and shows sizes of standard drill jig frames or boxes. From the numbered record cards the standard time for most of the operations can be figured. Another typical card, giving data for boring for bushings, is shown in Fig. 5. Where a standard time cannot be set from any of the data available on the time-study department cards, an estimate is made, or a new time study is taken.

After the time-study man has arrived at his values for the different operations, he makes out the form shown in Fig. 6, which he sends to the cost department for the purpose of having the latter make up instruction cards for the shop, and also for making a permanent record on a card form for filing. This standard time sheet contains all of the information relative to the making of the jig, with the operation number, the section in which it is being made, and the time allowed. In designating operation numbers, it has been found necessary, in order to avoid confusion, to set up a series of standard operation numbers which always refer to the same class of work, no matter on what job the man is working. For example, operation No. 1 is always fitting, and operation No. 12 is always turning on an engine lathe.

Should the fitter receive material from the stockroom that is not the size called for on the sketch, because of the fact that the proper stock is not available, he will inform the time-study man of the change in size, and the latter will figure the difference caused by the change, and put the time or bonus allowance on a supplementary slip similar to that shown in Fig. 6, which will be recognized in the cost department for the payment of the extra time to the man. Unauthorized changes are not recognized.

56-A BORE FOR BUSHINGS ± ".002 LOCATION

| | Taps 10 Dr. Vo Th | Taps 2 Dr. ½ Th | Taps 1 Dr. ½ Th | Taps 2 Dr. ½ Th | Taps 1 Dr. ¾ Th | Taps 2 Dr. ¾ Th | Taps 1 Dr. 1" Th | Taps 2 Dr. 1" Th | |
|---|---|---|---|---|---|---|---|---|---|
| Up to ¼ including 1" O.S. Dia. | .230 | .348 | .287 | .435 | .365 | .565 | .435 | .677 | Reamed |
| " " " | .309 | .465 | .383 | .583 | .574 | .756 | .606 | .904 | Bored |
| Over 1" O.S. up to ¼ including 1¼" O.S. | | | .320 | .480 | .556 | .628 | .628 | .832 | Reamed |
| " " " | | | .406 | .616 | .732 | .800 | .765 | .976 | Bored |
| Over 1¼ O.S. up to ¼ including 1½ O.S. | | | | | | | | .840 | Reamed |
| " " " | | | | | | .976 | 1.04 | 1.216 | Bored |
| Over 1½ O.S. up to ¼ including 1¾" O.S. | | | | | | | | 1.056 | Reamed |
| " " " | | | | | | | | 1.456 | Bored |
| Over 1¾ O.S. up to ¼ including 2" O.S. | | | | | | | | 1.576 | " |
| Over 2" O.S. up to ¼ including 2¼ O.S. | | | | | | | | 1.696 | " |
| | | | | | | | | | " |

SEE OTHER SIDE FOR NOTES OVER

*Fig. 5—Another typical time-study data card, which gives general information on boring for bushings. These cards cover a wide range of machine work, and are added to continuously as the data become available*

STANDARD TIME

Dwg. Title Drill Jig — Dwg. No. F-52334 — Sub.
Part — Ins. Spec. #62886-D-3 — Sub.
Mill — Size — Dia. Sheet — L. Spec. — Sub.
Mach. Tool No. — Dept. Tool or Part No. — Standard Time: 1st Piece — Each Add'l Piece

| Operation | Serial #6197 | Oper. No. | Section | Hour Rate | | |
|---|---|---|---|---|---|---|
| | | | 50 | | | |
| Make complete except oper. 2,5,6,7 | | 1 | M-51 | | | |
| | | | 53 | | 8.25 | |
| Shape Items 1,2 | | 2 | M-52 | | 5.25 | |
| Bore 5 bush holes & 1 hole to suit Item #3 | | 6 | M-51 | | 3.25 | |
| Circle grind & fit Items 5,6 | | 7 | M-50 | | .85 | |
| Turn items 3,5,6 | | 12 | M-51 | | 2.00 | |

Time Clerk — Cost Clerk — Date — Signed — Rate Clerk

*Fig. 6—Time-study department form for sending out notification of the "standard time" allowable on operations. This form gives the information to the cost department as well as the shop, and serves as a general notification*

GROUP TIME AND PRODUCTION REPORT

THIS FORM MUST BE TURNED IN DAILY

FOREMAN _____ DATE _____ SECTION W 51 GROUP NO. 5

TIME STUDY MAN _____

GROUP LEADER Heilacker

IMPORTANT: TIME CLERK MUST INDICATE WHETHER "FIRST PIECE" OR "SET UP" AND "EACH ADDITIONAL" OR "EACH PIECE" STANDARD TIME VALUES ARE SHOWN *

COSTING RATES: STD TIME | DAY WORK

| NAME | CHECK No. | HOURS REG. | HOURS O.T. | ORDER No. | DRAWING | ITEM | OPR'N | DESCRIPTION OF OPERATION | CODE | BASE COST EACH | BASE COST TOTAL | PIECES | STANDARD TIME VALUES * FIRST PIECE SET UP | STANDARD TIME VALUES * EACH ADD'L EACH PIECE | STANDARD TIME VALUES * TOTAL | DAY WORK HOURS | COST | QUANTITY APPROVED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Heilacker | 50 | 83 | 3 | 6197 | F-52334 | | | Fitting | | | | 1 | 8 75 | — | 8 75 | | | |
| Bongard | 22 | 83 | 3 | 6078 | K-63421 | | | " | | | | 1 | 28 31 | — | 28 31 | | | |
| Wells | 46 | 83 | | 6407 | M-47893 | | | " | | | | 1 | 56 50 | | 56 50 | | | |
| Simon | 183 | — | | 6432 | B-43341 | | | " | | | | | | | | 12½ | | |
| Bush | 186 | 83 | | | | | | | | | | | | | | | | |
| Clawson | 94 | 83 | | | | | | | | | | | | | | | | |
| Kromer | 189 | 83 | 3 | | | | | | | | | | | | | | | |
| Smith | 14 | 96 | | | | | | | | | | | | | | | | |
| Anderson | 37 | 83 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | TOTAL | | | | |

*Fig. 8—Time-record form kept by the group leader. On this form a record is kept of the bonus jobs worked on by the toolmakers in the group, and a copy is sent in to the payroll department at the end of each day.*

Serial 6197 — Form 3338—W. E. & M. Co. Works Dept.

Operation No. 6 W-51 Drawing No. F-52334 Sub No.

Part Drill Jig Tool No. 62886-D3

Operation Bore 5 bush holes & 1 hole to suit Item 3

Material & FORWARD TO INSP. DEPT.

3.25 Hrs.

Machine Tool No Description of Machine

Remarks

Date 1-30-28

Printed in U.S.A. JOB INSTRUCTION CARD

*Fig. 7—Job instruction card for the toolmaker. This card is made out by the cost department, and is given to the workman by the group leader in the toolroom*

Before the time-study estimates of standard time are received in the shop, the foreman will already have looked over the job, and will have turned his three copies of the blueprints over to the group leaders. The group leaders are the sub-foremen in charge of from ten to fifteen toolmakers. When the time-study department has computed the values, therefore, they are sent directly to the group leader, and the stock material is delivered to the fitter, who in turn distributes the various pieces of stock material to the different machines and toolmakers designated to do the work by the group leader. The group leader will have in his possession a copy of the permanent form, containing the data from Fig. 6, which was sent from the cost department, and also a job instruction card, Fig. 7, for each operation called for on the form, Fig. 6. These job instruction cards are turned over to the toolmakers with the material. When the machine work is done and after the fitter has received the different parts and has completely assembled his jigs ready for shipping, the job is turned over to the inspector.

The form shown in Fig. 8 is in the possession of each group leader, and is made out by him. It serves as a time slip for all men connected with his group, and is turned in once a day. This form also acts as a shipment report, and the payroll department accepts this statement, accompanied by the job card, Fig. 8, as an indication that the job has been completed and that payment is due the man.

# Importance of Specifications

By A. L. Walker
*Kennington, England*

A CUSTOMER'S specification for machines and equipment is important and is given due respect. Generally speaking the production engineer has little or nothing to do with such specifications. Those that fall within his scope deal with standard shop operations and with the material he uses. Various grades of limits and fits might be included in the term "specification." These minor specifications form the link between production and design, and production and purchase.

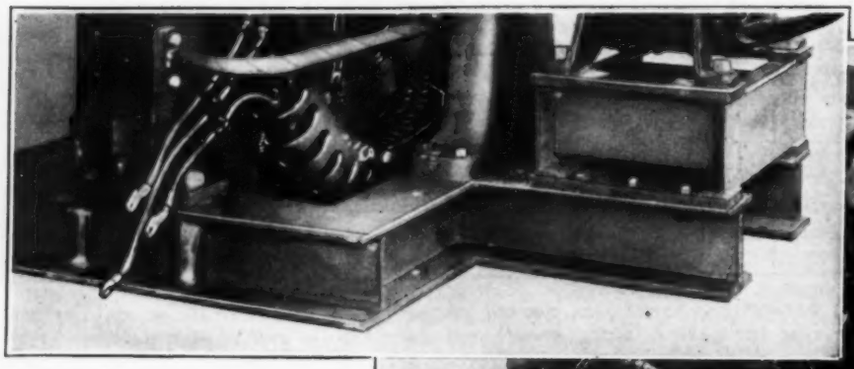
That specifications must be followed closely is emphasized by a rigorous inspection of incoming material and an equally active system of rating for different shop operations. The production engineer insists on specifications being followed to the letter, though certain departures may be allowed in specific cases. This is as it should be. It is unfortunate that procedure and material are often based on poor specifications. Unless specifications are accurate and commercial they are detrimental.

Why are so many specifications out of date? Largely because their preparation has rarely been accorded sufficient managerial consideration. Cases are common where the preparation of specifications has been left to junior draftsmen or beginners in the planning department. The job has too often been considered as a clerical instead of an engineering one. This is entirely wrong. A faulty specification may waste more money in a week than a good automatic machine can save in a year.

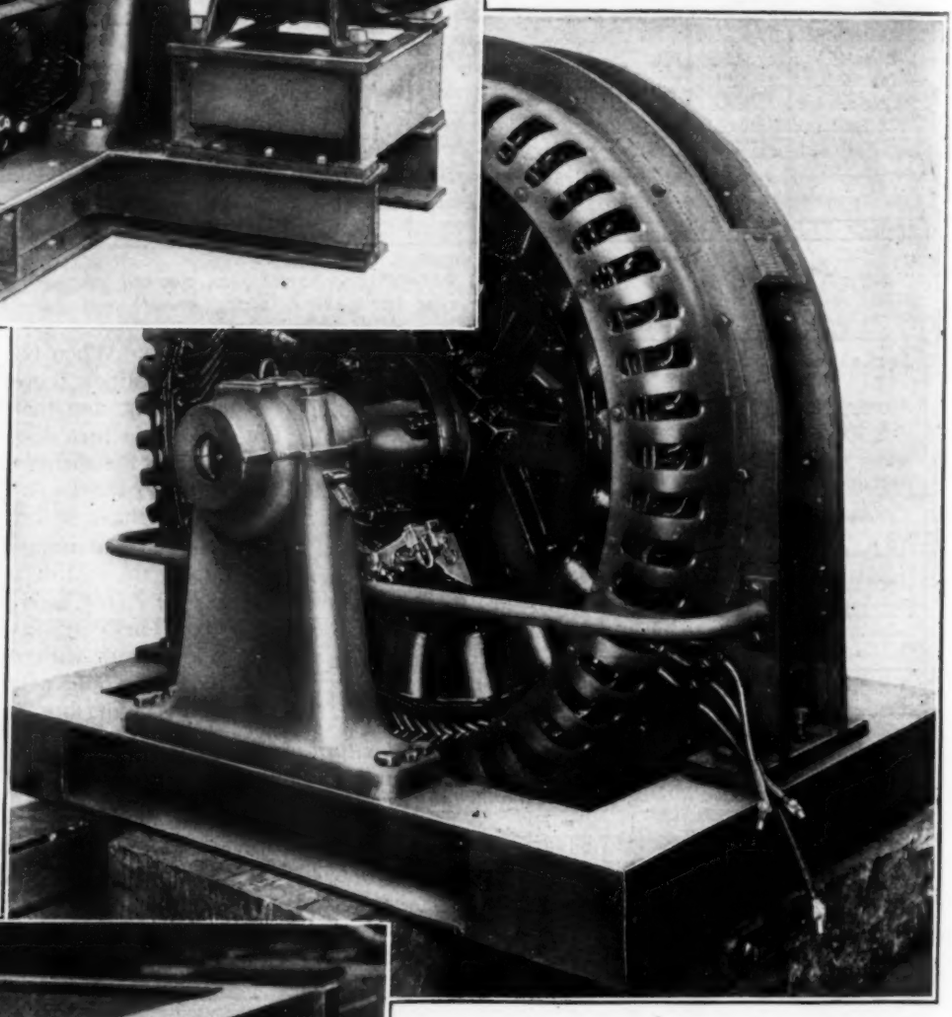
The preparation of even a simple specification costs money if done properly. It cannot be written as can an order for a new tool. It should not be issued either to the shops or to the purchasing department until all existing information on the subject has been consulted and given consideration. The annual cost of working to specifications is enormous. The work of the production engineer deals with reducing this cost to a minimum. Specifications should be kept up to date.

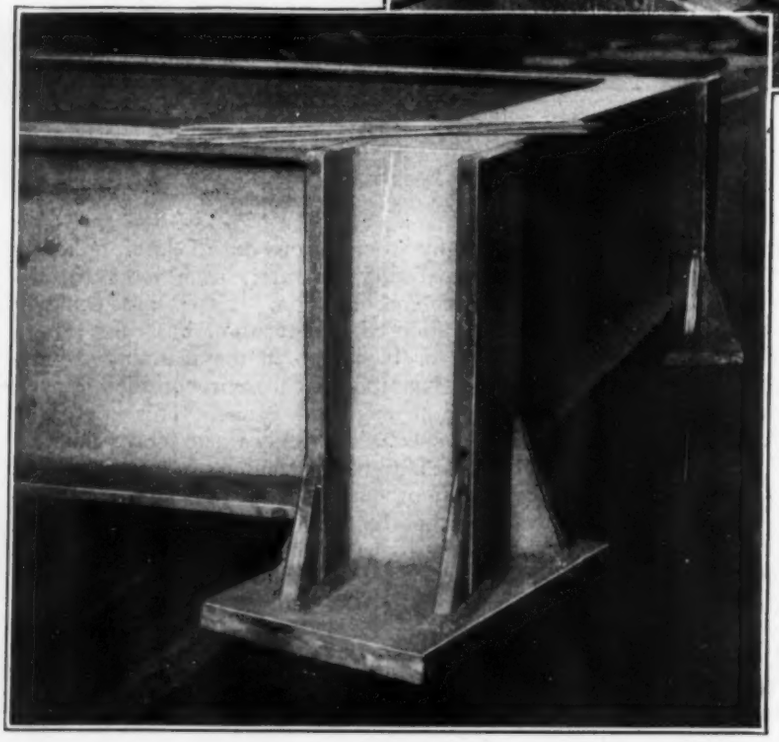
# *Art in Welded Designs*

Photographs by courtesy of the
Westinghouse Electric & Manufacturing Company



In the first stages of the use of welding for the building up of machine parts that had previously been cast, the large savings in cost apparently offered the temptation to go to extremes in cost savings, with the result that welded machine jobs were not generally things of beauty. The graceful and pleasing lines of the old castings were in many cases supplanted by built up sections of structural shapes which gave the impression that the scrap heap of a building contractor was the source of supplies





Manufacturers of welding equipment are now advocating a return to the designers' art in pleasing lines in welded machines, and the ultimate results in straight line effects may be even better than the old-fashioned curves of the castings. In Fig. 1 is shown a welded motor bed that is characteristic of the general run of welded jobs previously done with standard structural shapes. In Fig. 2 is shown the same type of base with the ugliness of the rough shapes hidden by finishing plates. The whole frame of this motor, with the exception of the pedestal, is made up of welded steel designed with a view to appearance. In Fig. 3 is illustrated an attempt to add beauty to the design of a heavy generator support. The I-beam sections have been disguised, and the base plates set at an angle. When the filling and painting is completed the built-up support is neater in appearance than a heavy casting

# · BOOK · REVIEWS ·

ELECTRIC HEATING. By Edgar A. Wilcox. Consulting Engineer. Four hundred sixty-nine pages, 5¾x9 in. Cloth boards. Published by McGraw-Hill Book Company, Inc., New York. Price $5.

THE largest and most important part of this book is that covering operating characteristics of household and industrial heating appliances of all sorts, and the kind of load which they create. It is particularly intended for the executive, engineer, and salesman engaged in creating markets for heating apparatus or the resulting heating load.

However, the engineer who wishes to find out what electrical equipment will do for him will find a readable presentation of the advantages and limitations of both electric and fuel heat. The engineer who occasionally has to design or investigate heating equipment will find helpful reference data. The chapters on the fundamentals of heat and electricity provide the necessary background under the same cover as the information sought.

SCIENTIFIC PURCHASING. By Edward T. Gushée, Purchasing Agent, Detroit Edison Company, and L. F. Boffey, Editor, The Purchasing Agent. One hundred and ninety-six pages, 5¾x9 in. Cloth boards. Published by McGraw-Hill Book Company, Inc., New York. Price $3.

ALEX DOW, in the foreword, has characterized this book as "a text book of fair dealing between buyer and seller." It is a text book also of fundamentals, seven principles of scientific purchasing being laid down by the author. It is particularly timely right now, when we are realizing that the study of production efficiency has left other branches of management far in the rear.

The importance of proper purchasing is emphasized by the fact that gross sales must be increased ten dollars on the basis of average profits, to compensate for each dollar of waste in purchasing. In industry as a whole, 57 cents of the manufacturer's dollar is spent for materials, 17 cents for wages, and the remaining item of 26 cents goes for overhead, interest, taxes, and profits. The theory behind the book is that a purchasing agent and a competent stenographer cannot handle the purchasing of a modern plant. The purchasing agent who works under such a condition is so engrossed in routine matters that he cannot take advantage of the real possibilities which confront him for saving money for his company.

THE ABRASIVE HANDBOOK. By Fred. B. Jacobs. Five hundred fifty pages, 6x9 in., cloth-board cover, indexed. Published by the Penton Publishing Company, Cleveland, Ohio. Price $5.

IN PRESENTING the handbook on abrasives and grinding practices, the author has included information pertinent to different forms of grinding, applicable in connection with many classes of manufacture. The book deals chiefly with the manufacture and the application of abrasive materials, but also points out economical methods of applying grinding operations.

Divided into 14 chapters, the volume contains more than 200 illustrations. The chapters are: Abrasive materials; Abrasive paper and cloth; Abrasive producers; Cylindrical grinding; Diamond data; Disk grinding; Grinding machines; Grinding practice; Grinding wheels; Honing practice; Miscellaneous abrasive data; Miscellaneous abrasive operations; Polishing and buffing; and Safe operation of wheels. Several tables and formulas are included.

In the chapter dealing with grinding practice is covered descriptions of grinding operations that do not come under specific headings, these including such operations as the grinding of balls, cutlery, drills, files, gears, knives, pistons, rolls, saws and tools. Under the chapter dealing with abrasive wheels are the standard specifications adopted by the Grinding Wheel Manufacturers Association, together with descriptions of miscellaneous grits, grains, and bonds. Data pertaining to the selection of wheels for different classes of materials are shown. As a reference guide the handbook should be found valuable for factory executives, grinding operators and students.

ROBB'S PATENT ESSENTIALS. By John F. Robb, LL.B., LL.M., M.P.L. Four hundred eighty-five pages, 6x8½ in., cloth-board cover. Published by Funk & Wagnalls Company, 354 4th Ave., New York, N. Y. Price $5.

INTENDED primarily for executives, engineers, lawyers and inventors, this book is rudimentary in nature, and contains information of a helpful nature for the expert practitioner as well as for the novice. The volume, which is the second edition, treats the subject in a concise manner, making the book especially beneficial to those who need information dealing with patents, but do not care to attempt the study of a multitude of highly-technical law books. Patent attorneys will find features in the work which will be of high value as a reference.

Nineteen chapters are included, these taking up such subjects as general matters and procedure, utility infringement, validity and investigation, miscellaneous legal subjects by patent examiners, application procedure, the science of drafting patent claims, appeals, design patents, assignments and contracts, and the 1927 revisions of patent laws.

The treatment of the methods of drafting patent claims is cited by several actual examples, including all the forms required for such procedure rather than the inclusion of the skeleton type. Various other phases of patent law and patent requirements, which are usually of a perplexing nature, are treated clearly,

PROBABILITY AND ITS ENGINEERING USES. By Thornton C. Fry, Ph.D., member Technical Staff, Bell Telephone Laboratories, Inc. Four hundred seventy-six pages. Cloth board covers. Indexed. Illustrated with curves and charts. Published by D. Van Nostrand Company, Inc., 8 Warren St., New York, N. Y. Price $7.50.

"IT IS the fundamental purpose of the theory of probability to answer such a question as: What is the probability of tossing an ace with a die?" Such is the opening sentence of the book, but crap shooters should not be so reckless as to purchase a volume. This book is only for the mathematician who has not forgotten his calculus. After a brief introduction in which the fundamental subject matter and basic axioms and "conventions" are set forth, the author immediately plunges into a discussion of permutations and combinations. The real test comes on page 21. If you can get

by factorials and the Gamma function, no fear need be felt as to the mastery of the remainder of the text.

An idea of the ground covered may be gained from the list of chapter headings that follow: Elementary principles of the theory of probability; probability and experiment, Bernoulli's theorem and Bayes' theorem; distribution functions and continuous variables; averages; the distribution functions most frequently used in engineering; curve fitting; the theory of probability as applied to curve fitting; and fluctuation phenomena in physics. Perhaps the chief interest of the book is in the examples chosen. The dice case has already been hinted; traffic delays in a telephone switchboard is another, psychic research problems, others; the bad penny, another. In a more serious vein, engineering problems arising in all branches of industry are solved, particularly in connection with higher mathematics.

DESCRIPTIVE GEOMETRY. By William H. Kirchner and Henry C. T. Eggers, professor and assistant professor, respectively, of drawing and descriptive geometry, University of Minnesota. One hundred and eighty-three pages, 5¾x9 in., cloth boards, 99 figures and supplementary exercises. Published by the McGraw-Hill Book Company, 370 Seventh Ave., New York City. Price $2.25.

MUCH can be said in favor of the author's development of the interrelation of the two geometries, descriptive and analytic. The general use of both graphic and analytic methods in the applied sciences demands that engineering and scientific students have a thorough understanding of the correlation of the two. Emphasis is placed on the fundamental principles of the geometry of the point, line and plane. It has been assumed that the student is familiar with or completing a course in analytics. This beginning course can be completed in a quarter of a semester.

A collected notation prevents a confused understanding of the contents. The text is divided into three divisions, Representation, Problems of Position, and Problems of Magnitude. To a large extent orthogonal projection in both the Mongean and Cartesian systems is employed, other systems being used for illustrative purposes only. Each problem is explained by both analytic and graphic solutions, and is usually followed by a group of exercises. A large group of supplementary exercises is appended.

SUGGESTIONS FOR THE PRACTICE OF COMMERCIAL ARBITRATION. Prepared by the American Arbitration Association. Two hundred and forty-seven pages, 6x9 in. Cloth boards. Published by Oxford University Press, American Branch, New York. Price $1.75.

THE executive staff of the American Arbitration Association is responsible for the policies and views expressed in this complete and useful handbook. It is prepared in a non-technical style for executives in business and commerce. Among the 130 or more points covered are such questions as to whether a dispute is arbitrable, whether fees should be paid to arbitrators, how to manage arrangements for arbitrations, when hearings should be waived, whether an arbitrator is qualified to act, how to draw a submission, what the arbitration law requires, and what records should be kept.

Over 100 pages are devoted to a summary of arbitration laws and rules. Drafts of suggested state arbitration acts, arbitration clauses for general contracts, and suggested forms are included; and about 150 cases and decisions are used throughout the work as illustrations.

THE LABOR PROBLEM. By J. A. Estey, Professor of Economics, Purdue University. Three Hundred sixty-eight pages, cloth board covers. Published by McGraw-Hill Book Company., Inc., 370 7th Ave., New York, N. Y. Price $3.

THIS book is suited to the requirements of the engineer and business man whose time for study is short, and who wants a general, comprehensive knowledge of various labor problems and their effect on plant operation and production. The industrial era has intensified problems affecting the wage earner. Machine methods of mass production have multiplied the evils attributed to division of labor. This text presents the development of labor organizations, their purposes, policies and economic value; it discusses the Union shop, and produces a thorough understanding of the results of scientific management, personnel work, regularized employment, and of the insecurity of the wage earner's life.

There are many texts dealing with single phases of the labor problem, but this appears to be one of the comparatively few that combine a comprehensive discussion of the subject with brief, unprejudiced facts.

WHO'S WHO IN AMERICAN AËRONAUTICS. Compiled by Lester D. Gardner. One hundred and seventy-two pages, 7x9¼ in. Published by the Aviation Publishing Corporation, New York. Price $1.00, postage 25 cents.

THIS is the third edition of a volume that was a pioneer in the field of aviation. It contains over 130 pages of brief biographies of men who have won a place in modern aëronautics, and includes airplane, engine and instrument builders, engineers responsible for advances in aircraft, and commercial pilots. The biographies are followed by a list of pilots licensed in this country. As a reference of those engaged in aircraft activities the volume will be found convenient and valuable. It is conveniently arranged for ready use.

FOREIGN TRADE IN 1928. Official Proceedings of the Fifteenth National Foreign Trade Commission. Two hundred sixty-one pages, 6x9 in. Cloth board covers. Indexed. Published by the National Foreign Trade Council, India House, Hanover Square, New York, N. Y. Price $2.50.

ACCORDING to the National Foreign Trade Council, we are in the midst of the world's greatest foreign trade year since before the war. The Houston Convention of the Council specialized on Latin America, which is the section of the world now vitally interesting to American manufacturers, and this book is largely a record of the progress that is being made in foreign trade relations in that area.

The book contains the complete addresses on various aspects of foreign trade as delivered at the convention, and the discussion on these subjects. Presumably it is up-to-the-minute information by experts engaged in foreign trade work. The subjects include: The foreign trade outlook; the prospects in Europe; preparatory market analysis; channels of distribution; export credit and finance; and packing for export. A list of delegates to the convention, with their company association, is given in the back. The book should be valuable to manufacturers interested in foreign trade.

# Joints for Welded Frames

*(Continued from sheet 21)*

The use of arc welding for building up machinery frames and bases offers savings in costs where possible to use them. This is especially true on work where only a few of one kind are manufactured. The factors of rigidity, strength, and appearance should receive attention. The accompanying illustrations show types of joints that have been found to give good service.

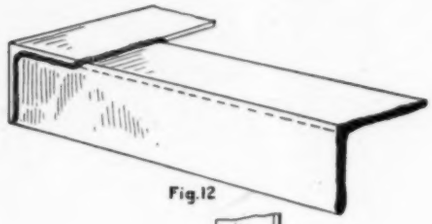


Fig. 12

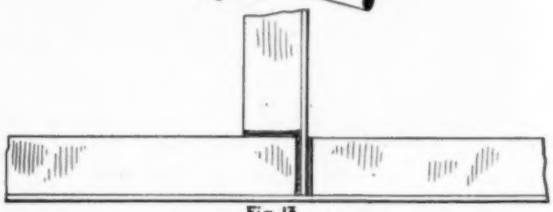


Fig. 13

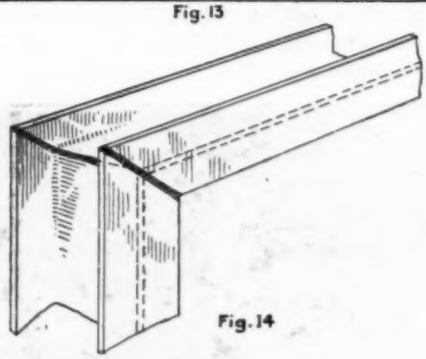


Fig. 14

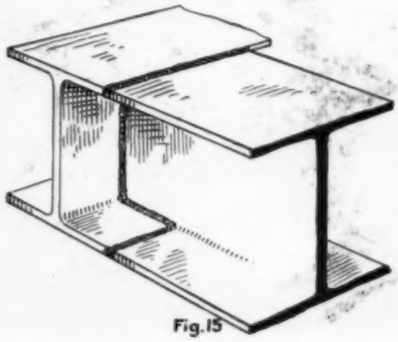


Fig. 15

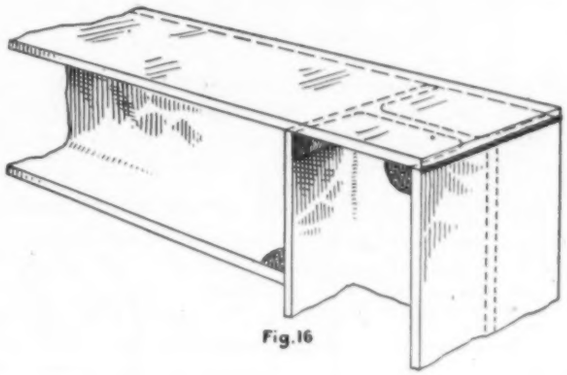


Fig. 16

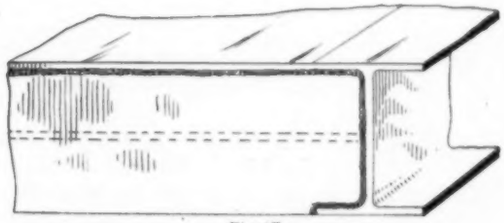


Fig. 17

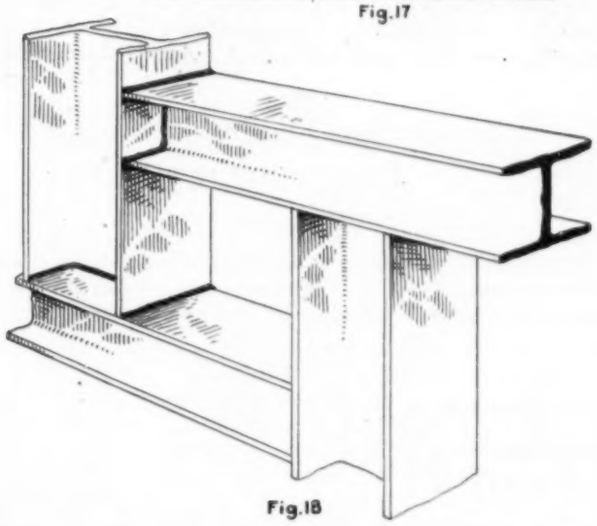


Fig. 18

*Fig. 12—A corner weld for angle iron. This weld requires preparation of the edges, but makes a strong and rigid corner. Fig. 13—A weld for angle-iron braces and extensions. Preparation of the edges is necessary for the best results. Fig. 14-15—Types of joints used on heavy machinery bases where standard I-beams are used. In Fig. 14 is shown a costly joint, but one that has the advantage of neat appearance. It also gives a flat surface on top and bottom. The joint shown in Fig. 15 is much used and is easily prepared. It also transmits the load from one member to the other irrespective of the weld. However, it is unsightly and should be covered with corner plates unless the base is to be hidden in the floor. In Fig. 16 is illustrated a very rigid joint, which is also neat in appearance. Fig. 17 shows a joint for flat top bedplates. The construction gives great rigidity. In Fig. 18 is shown butt welds used on a bearing bracket constructed of I-beams. Only square ends are necessary to prepare the joint, as fillet welds are used and left on after welding.*

Courtesy of the Westinghouse Electric & Manufacturing Company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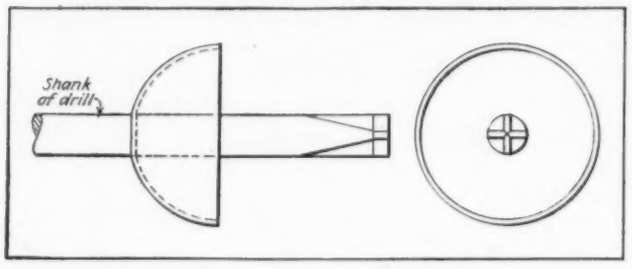
# IDEAS · FROM · PRACTICAL · MEN

*The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit*

## A Dust Guard for a Drill

By R. M. Thomas

When drilling holes overhead in concrete, stone or brickwork, a guard such as the one shown in the illustration should be placed over the drill shank to catch the dust and chips, so that they will not go down the



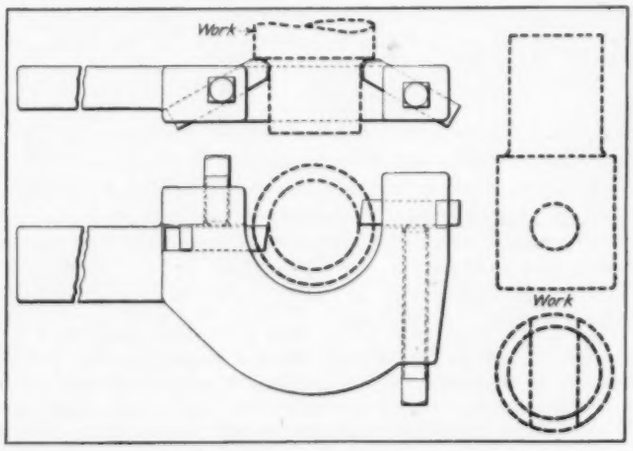

*Dust guard for a drill*

barrel of the drill (if an air drill is used) on to the hands of the operator, in his eyes or on the machinery. The guard, or pan, will help to keep the surroundings clean, lengthen the life of the drill, and render the job much less disagreeable. The guard can be made from a section cut from a rubber ball of suitable size.

## A Production Toolholder for an Engine Lathe

By J. E. Fenno

The toolholder shown in the illustration was used for necking down the ends of cold-rolled pieces one of which can be seen at the right in the sketch. The pieces were held in a chuck and a rough finish was all that was required.




*A double-bitted toolholder*

Before this holder was made, the work was done by a single tool in one cut. As the parts were routed through the factory in large quantities, the double-bitted toolholder was made to expedite the work. Its use permitted a much faster feed, with the result that the production was increased about 30 per cent. This saving paid for the toolholder in a very short time.

The toolblock in the lathe used for the operation is of the double-strap type with four clamping bolts, and gave rigid support to the holder.

## Brazing and Testing Oil Lines

By Frank C. Hudson

Oil lines are an important part of an automobile engine, especially when they are inside the crankcase, as is customary. It is not only necessary to have joints

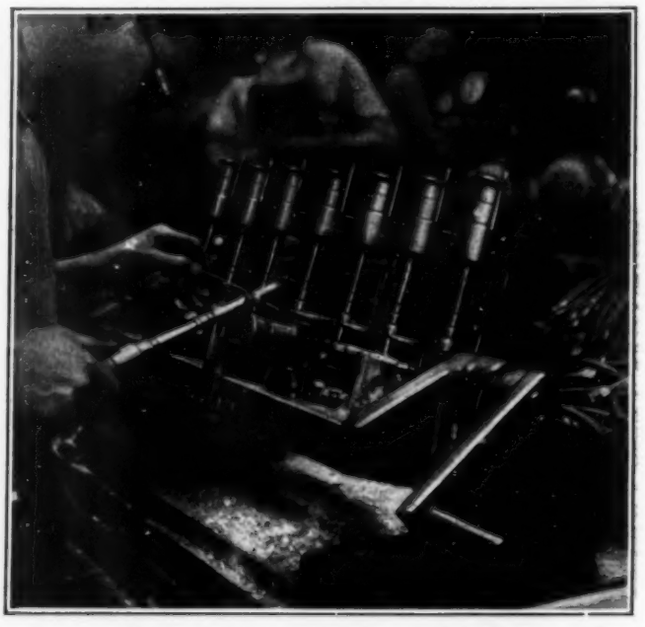


*Fig 1—Brazing fixture for oil pipe lines*

tight and strongly brazed but also to **know** that the oil line is clear.

The brazing fixture in use in the Graham-Paige shop is shown in Fig. 1. Each outlet of the pipe is held in position by upright plungers while the horizontal lead is clamped by two screws in front. With the different members of the pipe line held firmly in position, it is an easy matter to braze every joint firmly.

After the brazing, the pipe lines are tested for leaks

*Fig. 2—Testing the pipe line with a steel ball*

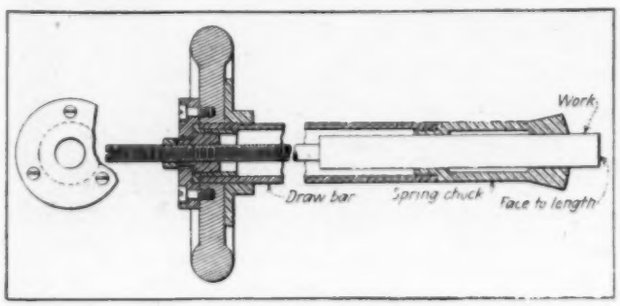
under working pressure. A simple but very effective test is made to make sure that the line is clear at all points. A steel ball dropped into each one of the branches, successively, as in Fig. 2, must roll out of the end before the pipe line goes to the assembly department.

## Adjustable Stop for Work Held in a Spring Collet

By H. L. Wheeler

The illustration shows an adjustable stop designed for use in a small bench lathe to eliminate the necessity of repeatedly removing the work to allow it to be measured for length.

The stop rod is made from a piece of $\frac{5}{16}$-in. cold-rolled steel of suitable length. It is threaded for about half its length and is provided with a screwdriver slot at the




*An adjustable length stop*

outer end. A split bushing is fitted to the bore of the tubular drawbar, and is expanded to fit tightly in the hole by means of a $\frac{1}{2}$-in. pipe plug, which is drilled and tapped to serve as a nut for the threaded portion of the stop rod.

The adjustment is locked by a check nut. A steel collar serves as a backing for the split bushing and prevents any possible disturbance of the adjustment after it has been made. The stop collar is bored to clear the square end of the pipe plug, and is secured to the handwheel by screws.

In use, the procedure necessary to obtain correct adjustment is to get the correct measurement on the first piece by the cut-and-try method, or by a suitable length gage. The stop and tool are then set to correspond, and any number of pieces can be duplicated within very close limits.

## Staples for Holding Paper on Drawing Boards—*Discussion*

By E. R. Plaisted

In an article under the title given above, on page 824, Vol. 68, of the *American Machinist*, Wm. C. Wise says there are several practical objections to the use of the stapling machine for fastening drawings to the board, but he mentions only two; the time required to locate the machine, if it is used by several draftsmen; and the possibility of staples jamming in the machine.

My experience is that thumbtacks also jam occasionally—up through their heads into the thumb of the draftsman, which isn't calculated to expedite his work. We have had several stapling machines in use for a couple of years—though not until recently on drawing boards—and it is very rarely that they fail to function perfectly. When they do clog, it is the work of but a few moments to free them, and the point of a knife blade is the only tool needed.

We have tried using gummed paper strips for holding drawings. It doesn't nick the scales of the drafting machines, as do tack heads, to be sure, but it is "messy" and inconvenient. We consider the stapling machine as near perfection for its purpose as any other tool we have in the drafting room. All tools have minor faults of some sort.

## Micrometer for Setting Turret Turning-Tools

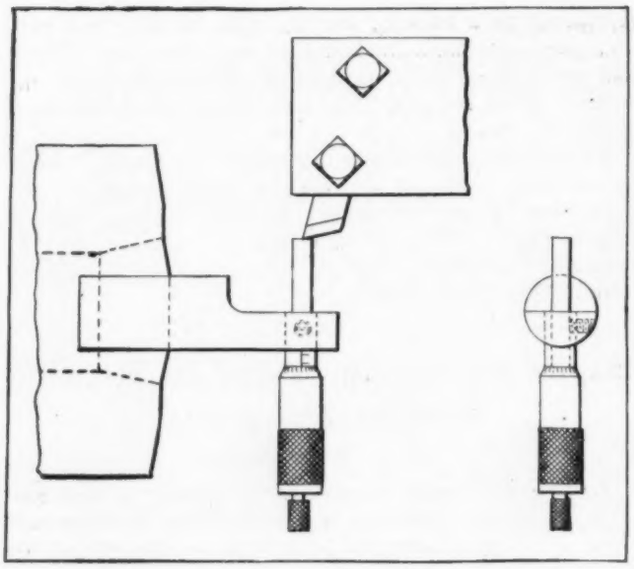
By Fred Klingenstein

By use of a micrometer head mounted as shown in the illustration, toolbits in either the regular turret or the one on the cross-slide can be set to turn work accurately to size.

The holder for the micrometer head is a piece of cold-rolled steel about 4 in. long and is ground accurately to 1 in. in diameter. About 1 in. of its length is cut away to the center line, and a transverse hole is drilled and reamed to fit the micrometer barrel. The holder is held in a draw-in collet in the machine spindle.

To set the toolbit to turn work to the required diameter, the micrometer is set to the proper radius and the cutting edges are brought into contact with the end of the measuring spindle. The reading of the micrometer is, of course, opposite to that of the ordinary instrument. For setting tools in the regular turret, the micrometer is set in a vertical plane. For setting tools in the cross-slide turret it is set in a horizontal plane. To make the change from one plane to another, all that is required is to rotate the machine spindle 90 degrees.

When tools are to be set to turn large diameters, an extension accurately fitted to the micrometer spindle, and



*Micrometer for setting turret turning-tools*

ground square on the end, should be provided. By setting tools with a micrometer mounted as described, the cut-and-try method of adjusting them is reduced to the minimum.

## Staples for Holding Paper on Drawing Boards—*Discussion*

By Walter Charles
*Safety Engineer, Brown & Sharpe Manufacturing Company*

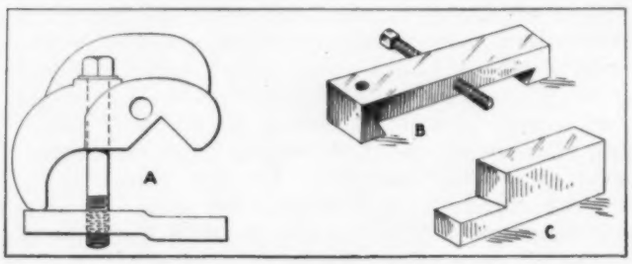
In an article under the title given above, published on page 823, Vol. 68, of the *American Machinist*, E. H. Plaistead speaks about the use of staples on drawing boards and the advantages of their use for holding paper, as compared to thumb tacks. One great advantage that staples have over thumb tacks, is they offer no obstruction to the free operation of the T-square and the triangles.

Staples, in addition to being used in the drawing room for holding the paper on the board, can be used to fasten notices, safety bulletins, etc., on bulletin boards. For this use they have demonstrated their superiority over thumb tacks, and have proved to be time savers.

## A Tool-Setting Gage—*Discussion*

By Trevor Bonsall
*Surrey, England*

The tool-setting gage described by S. W. Sullivan on page 433, Vol. 68, of the *American Machinist*, hardly fills the bill, because its use necessitates stoppage of the machine for setting the tools to the different positions, and on close-limit work it would slow production.




***Two clamp stops for lathes and a stepped gage for shoulder work***

Nearly all American lathes are provided with clamp stops for the beds, as at *A* and the clamps have screws to adjust the limit of longitudinal traverse of the carriage very closely. I have fitted the compound rests of English lathes with clamp stops as at *B*. Using either of these stops, depending on the distance between shoulders, slip gages are inserted between the stop and the part by which the tool is moved.

After facing one of the shoulders, with a slip gage in place, the gage is removed and a shorter one of the proper length is put in its place. Either the carriage or the compound rest is moved against the gage, as the case demands, bringing the tool in position for facing the next shoulder. As many gages can be used as the work requires.

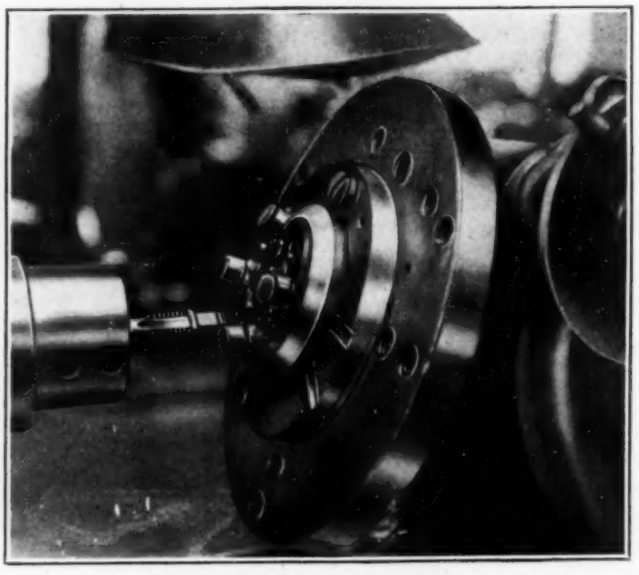
The gages need not be separate pieces, but may be made with as many steps as required. The gage at *C* is for a piece having three shoulders. The longest part is for one shoulder; the step for the next shoulder, while for the third shoulder the gage is removed and the carriage, or rest, is brought into contact with the adjustable screw in the stop.

The same method of stop gaging can be applied in internal work, where holes of different diameters are to be bored to specific depths.

## A Turning Operation in a Milling Machine

By O. S. Marshall

The part shown in the dividing head of a milling machine has four legs, ½ in. in diameter and equally spaced. They are at an angle of 20 deg. with respect to the axis of the piece, and the problem was how to finish them.



***Turning in a milling machine***

Turning the legs in the milling machine did not suggest itself to the designer. How the job was to be done was left for the workman to puzzle over, and he did the job in the manner shown in the illustration.

The work was held on a faceplate on the spindle of

the dividing head, and was readily indexed to bring each leg into position. The turning was done by a tool made from an old tap, and held in an offset head.

## Seating and Reaming Valve-Guide Bushings

By Herbert F. Crawford

Valve-guide bushings are much alike in many makes of motors. In addition to the necessity of having them properly machined so as to seat squarely and have holes concentric with the outside, is the need to so force them into place that they will be square with the valve seats and in line with them. The Continental Motors Corporation has adopted a method of forcing valve-guide bushings into place that has proved very satisfactory, both as to the time saved and the results obtained.

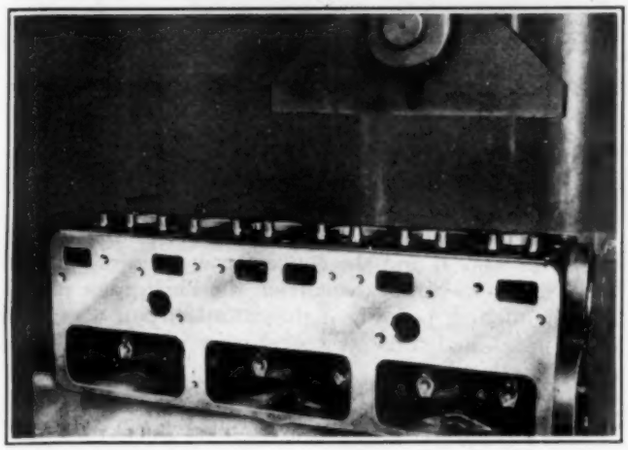


*Fig. 1—Valve-guide bushings ready to be forced in place*

A cylinder block is placed under a forcing press, as in Fig. 1, and the valve bushings are set in position by hand. Then the fixture in Fig. 2 is placed over six of the bushings and the ram of the press is lowered until the equalizing beam has forced down the six plungers under it, and the beam rests on the two abutments under the ends. The plungers shown have then forced each bushing down to its proper depth. The cylinder block is then moved so that the other six bushings can be forced into position in the same way.

After all the studs have been set, the cylinder block is sent to the high-speed drilling machine in Fig. 3, and the valve-guide holes are finish reamed as shown. The block is mounted in an indexing fixture and is moved from point to point until all twelve holes have been reamed.

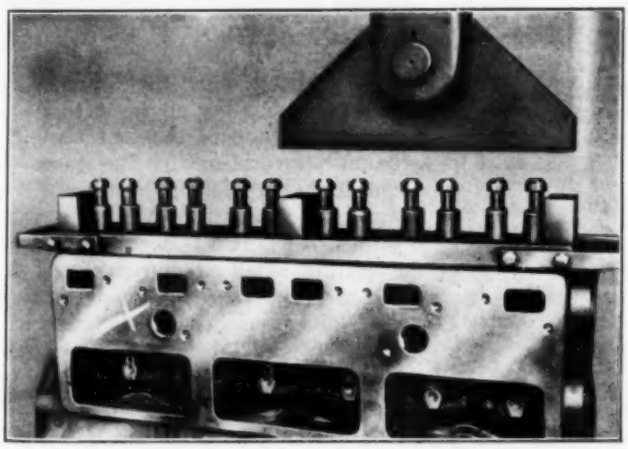


*Fig. 2—Fixture with plungers for forcing bushings to seats*

*Fig. 3—Final reaming the bushings after they have been seated*

## A Spring Nut Lock—*Discussion*

By Elton Sterrett

In an article under the title given above, on page 943, Vol. 68, of the *American Machinist*, R. H. Kasper described a nut lock that reminded me of our experience in the matter.

We used nut locks with the nuts shouldered as described by Mr. Kasper, but found that the nuts had a most exasperating faculty for turning up missing about the time the locomotive was due on the hostler's track—or a nut would acquire a slight burr on the faced-off corners from an oversize wrench, and the lock would refuse to spring out from the recess. So, to replace the comparatively expensive operation of facing the bases of the nuts, we merely bored out washers to give the same result. For the nut for a 1-in. bolt, for instance, having a dimension of $1\frac{9}{16}$ in. across the flats, we used a $\frac{9}{16}$-in. washer (outside diameter approximately $1\frac{1}{2}$ in.) and bored it out to $1\frac{1}{32}$ in. The thickness of $\frac{7}{64}$ in., gave sufficient clearance for the spring lock.

With this scheme, instead of having to turn each nut singly, we bored out a stock of different sizes washers for those bolts requiring adjustment, and kept them handy in the toolroom, from where the mechanic could draw as many as he needed, at the time of his need.

## Finding the Bearing Surfaces of Gear Teeth

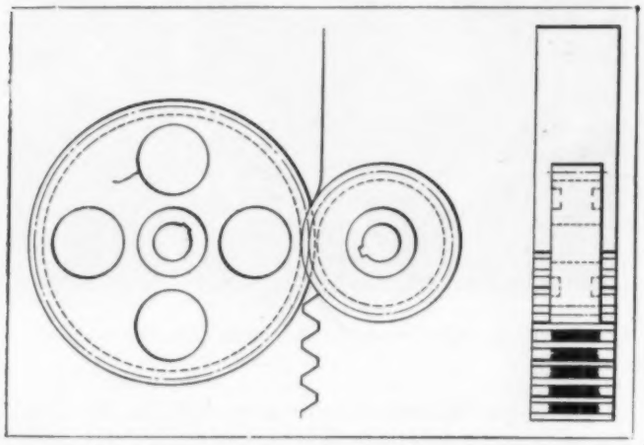
By L. Coon

A simple and effective method of finding the bearing surfaces of gear teeth, is to feed a narrow strip of paper between the gears while they are running, as shown in the illustration. The paper should be somewhat wider than the faces of the gears.

If the gears are slightly oiled or greased, and are

allowed to run for some time before running the paper through them, the imprint on the paper will be dark and will give a good indication of how the teeth bear. Also, it will detect any misalignment of the shafts, because if the shafts are out of line, the imprint will be darker on one side.

The finer the pitch of the gears, the thinner should be the paper that is run between them, so long as the teeth



*Using paper to record the bearings of gear teeth*

do not cut through it. The thickness of the paper to use can be judged by the amount of clearance at which the gears are to be run.

This method has been found very satisfactory in testing automotive timing-gears, and we have adopted it in our experimental work with success.

## White-Metal Melting Furnace

By Albert Koeniger
*Montigny-les-Metz, France*

The difficulties encountered in a railroad car shop in casting white-metal bearings as a result of the oxidation of the metal on the surface of the melting pot, led to

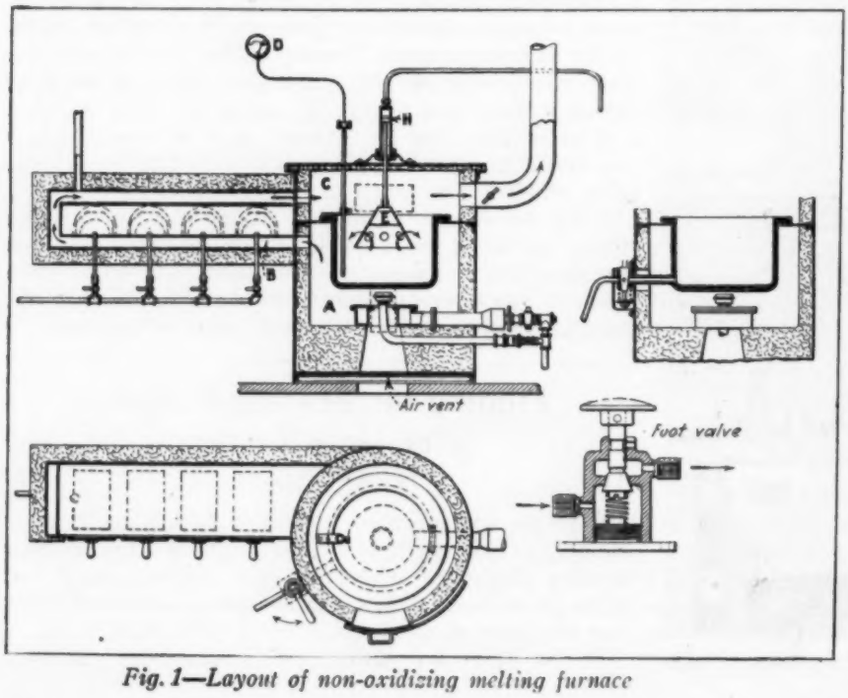



***Fig. 1—Layout of non-oxidizing melting furnace***

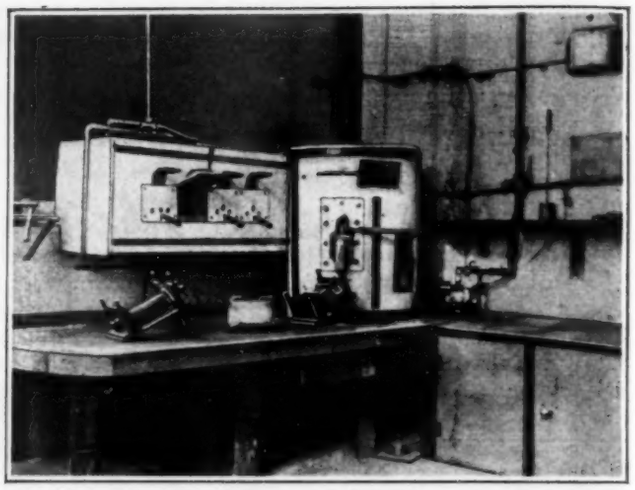


***Fig. 2—Furnace for pre-heating bearings and melting babbitt metals***

the building of a furnace which eliminated this trouble, and at the same time utilized the waste heat from the pot for preheating the bearings.

A diagram of the melting pot and preheating oven is shown in Fig. 1, and the convenience and simplicity of the installation can be seen from the illustration in Fig. 2. The melting pot, Fig. 1, has a capacity of about 800 lb. of metal, and rests on a steel plate which is fastened to the steel cylinder. This cylinder is lined with fireclay. The flame from the gas burner strikes the bottom of the pot, and the excess heat from the pot and flame passes out of the chamber *A*, through the passage *B*, into the chamber *C* above the molten metal, and then passes out through the flue provided at the right. There is thus no free contact of air with the molten metal, the hot gases from the flame having no oxidizing effect on the alloy. The molten metal is kept at a normal temperature of 380 to 400 deg. C., which is indicated by the pyrometer *D*. For agitating the molten metal to clear it of impurities, the sheet-steel cone *E* is suspended from a piston in the air cylinder *H*. This cylinder is connected by means of a ¼-in. pipe to the compressed air line, and is operated by a treadle valve under the bench. From time to time the operator presses the valve, and the air forces the cone down through the molten metal. The cone has an air chamber at its apex, and is thus able to rise again by its own buoyancy. The molten metal is drawn off at the bottom of the pot for casting.

The preheating of the bearings is done in the chamber at the left of the furnace, and due to the fact that the original temperature of the gases is about 1,200 deg. C., the heating of the bearings is ordinarily rapid. For large bearings, or where it is desired to hasten the heating, small gas burners are provided at the bottom of the preheating oven. The melting pot installation has been highly successful, and has cut down the consumption of fuel, as well as eliminating all troubles from oxidation. It is only necessary to clean out the pot every 10 to 15 days. The installation can be made easily in almost any shop.

# · TECHNICAL · ABSTRACTS ·

### A Plan to Abolish Unemployment

Mr. Benjamin A. Javits, attorney for several trade associations, is engaged in drawing up some proposed amendments to the Sherman Law, at the instigation of the Commerce Committee of the American Bar Association. The first draft has been completed. Mr. Javits' plan, as given in an unofficial interview, is as follows:

It is proposed to extend the personnel and scope of the Federal Trade Commission, so that it will consist of eleven members, two representing industry, two labor, two banking and finance, besides two recognized political economists, and three representatives of the public at large. Second, it is proposed that the Sherman Law be revised as necessary, so that industries which are failing to give the public adequate service because of the restraint the law now places upon them, might be exempted from the law and not only permitted but encouraged to combine to control production and distribution. Third, it is proposed that industry get together in an institute for industrial co-operation, in other words, in an institute of trade institutes.

If business men do get together with somewhat the same spirit in which they got together in the War Industries Board in 1918, Mr. Javits is sure that they can find a way to abolish unemployment. And they can also find the way—so he is advised, to make American industry many times more efficient than it is today, to double wages, to make the work day still shorter, to reduce crime, and to usher in an era of all-around prosperity and peace.—*Forbes Magazine*, July 1.

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### Welding Aluminum Castings

The first step in the admittedly difficult process of welding aluminum castings is to make sure that the surfaces to be welded are scrupulously clean. Any oil should be burned from the surface, and any oil retained due to the natural porosity of the material should be expelled.

Aluminum or aluminum alloy castings up to $\frac{1}{4}$ in. in thickness, can be welded without bevelling the joints, using a puddling tool and spatula. The procedure consists in agitating the metal while molten, in order to break up the oxide, and to allow the metal to flow together. The puddling tool should be wiped frequently, so that it will not become coated, and it must not be allowed to reach a red heat.

Both edges of aluminum castings above $\frac{1}{4}$ in. in thickness should be bevelled or grooved to an angle of 45 deg., so as to form a right angle at the weld. Welders should avoid overheating a casting during preheating, never exceeding 700 or 800 deg. F. A cold aluminum casting gives forth a metallic sound when struck, whereas, at a safe preheating temperature it will no longer resound.

The use of a good flux is recommended. The best method of applying the flux to the joint is to dip the end of the heated welding rod into the flux, which will adhere in the form of a small tuft, to form a thin varnish along the rod. More flux than this is unnecessary.—William Mason, *The Metal Industry*, May.

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### Control of Costs of Building Tools

In order to establish a definite means for speeding up output and controlling the cost of a class of work that is, in a sense, non-repetitive and difficult to estimate, a measure of the operator's performance and an incentive for his work become necessities. The problem of the Hawthorne Works of the Western Electric Company, relative to the manufacture and repair of tools, was successfully met through the installation of an estimating plan.

The Hawthorne works has approximately $12,000,000 invested in tools and $1,000,000 in toolroom equipment, which is indicative of the size of its problem for the control of tool costs. The toolroom is divided into a number of main groups, which are in turn divided into special sections. This faciliates classification and supervision.

The method employed to improve tool manufacture performance, known as the estimating plan, involves the advance determination of an estimated time for each operation on the individual tool parts. This system affords a means of rating the workman by setting a time value on each repair operation and comparing the workman's time with the standard. It may also be used as the basis for determining wage increases of the individual worker, and places the responsibility for advancement on his shoulders. The application of this plan has resulted in an added incentive for increased effort on the part of the worker.

It is the supervisor's responsibility to see that the estimate is met. This gives the supervisor increased interest in his job and immeasurably increases his knowledge of his men and his work. There is a constantly improving efficiency occasioned by the gradual installation of time or job standards, and the increasing efforts of the operators to maintain high ratings by meeting the standards. Simple repair jobs, estimated at 6 hours when the plan was started, and requiring the same amount of time to complete, are now estimated at half this amount, and are often completed in less than the estimated time.

The records kept on the job contain information concerning the time consumed by each class of labor, the clock number of each man, and notes of any unusual conditions prevailing. Such a record, kept over a period of years, constitutes an invaluable foundation for the establishment of efficient time and wage rates, and controls the cost of builders' tools.—G. A. Pennock, *Mechanical Engineering*, July.

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### A Precision Measuring Device

In certain cases, where very small elongations or contractions have to be measured, as is the case with certain instruments, the measuring device known as the Huggenberger tensometer, magnifying up to 1,200 times the actual change in length, is often used. In many cases, however, the degree of accuracy required is such that a much greater magnifying capacity is needed. The combined mechanical and optical precision measuring device invented by Dr. Geiger answers this purpose. This instrument will multiply the change of length obtained from 20,000 to 200,000 times.

The general structural features of this apparatus and its principle of operation are here given. To the lower part of a brass or nickel-steel frame are fixed two points with a distance between of 14.8 mm., or nearly $\frac{11}{16}$ in. These points are placed into small depressions previously punched in the object by a special double-punch. There are two mirrors of which one remains fixed during the measurement, and the other changes its inclination through a system of levers, whenever the slightest change in the base-length occurs. Opposite the mirrors is a scale and also a telescope through which the reflection of the scale in both mirrors can be watched. By the difference in both readings the elongation or contraction is ascertained and recorded.

The calibration of the instrument is made on a metallic plate of known tensile strength and elastic properties. A repetition of the calibration is made from time to time because the slight wear of the knife edges of the lever affects the results by modifying the magnifying effect of the setting.

If changes of temperature are not small, or tensions produced by temperature changes are measured, it is necessary to determine the temperatures of both the frame and the scale by thermocouples, and then make the necessary corrections.

The instrument is easily attached to the object under study. It gives the total deformation in a certain direction, and by making readings in three mutually perpendicular positions, the actual tension produced may be determined by well-known formulas.—Von Jul. Oelschlaeger, *Werkstatts Technik*, May.

American Machinist

*Editors:* KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

### *Buyers Frequently Increase Sales Costs*

MUCH of the high cost of selling, of which so many buyers complain, is due to the buyers themselves. The buyer who boasts that he is "a hard man to sell to," as we frequently hear him do, helps to add to the costs for which he, and all other buyers, must pay.

Wasting a salesman's time by keeping him waiting unnecessarily, delaying orders, forcing the seller to incur unnecessary traveling expense, all add to the cost of selling, and to the price that must be paid. True, it is sometimes inconvenient to take time for interviewing salesmen, and the tendency is to let them wait. But it adds to the cost of selling whether our salesman, or the other fellow's, is obliged to waste his time.

Part of the attitude toward the man who sells comes from the perverted idea that the buyer is conferring a favor in making the purchase. In reality the only reason we buy anything is because we prefer what we buy to the money we exchange for it. Hence there should be no more feeling of favor on one side than the other.

Sales costs are too high in many industries but the buyer is usually at least partially responsible. If buyers will study their side of the transaction with a view toward eliminating unnecessary costs and unfair demands we shall have made a step in the right direction.

### *Study of Equipment Obsolescence Should Be Supported*

FOR a long time the *American Machinist* has been campaigning against obsolete equipment. The efforts have borne fruit in the machinery industries—in the plants building machinery and making metal products.

But what of the many plants using machinery to make non-metallic products? With forty-four per cent of metal-working equipment more than ten years old in 1925, as shown by the *American Machinist,* industries less progressive must have offered enormous opportunity for replacement.

During the past three years the metal working plants have improved greatly, if judgment can be based on the present appearance of equipment and reports that reach the interested observer. In the industries without definite leadership against the obsolete, conditions probably have remained about as they were.

In view of these conditions, announcement of the study of industrial equipment to be undertaken by the Department of Commerce comes as a welcome piece of news. As reported elsewhere in this issue, one of the objects of this study will be to determine the amount of obsolete equipment in industry and its importance as a factor in the inability of firms manufacturing similar products to compete on an equally profitable basis.

The Department recognizes that a machine may be obsolete though in point of service there may be ahead many years of usefulness; that it may be advisable to consider obsolescence as a hazard rather than an arbitrary compromise with depreciation as at present; and that cost accounting methods probably will have to be revised to give full consideration to obsolescence.

This study of industrial equipment should receive the active co-operation of all management, which is interested now in knowing the why of "profitless prosperity." Common sense would place much of the blame on obsolete equipment; probably as much more on faulty methods of distribution; and a large share on inefficient management. The study by the Department of Commerce should establish the position of at least one of the variables affecting our peculiar kind of prosperity.

### *Give the Customer What's Right*

IF MORE American machinery builders would adopt the policy of a leading English machine tool firm they would be far better off. This firm finishes beds, ways and other bearing surfaces by grinding. Asked whether the customer had got over demanding that every such surface be finished with a hand scraper, the sales manager observed that the policy of the firm was to give the customer what was known to be right and make him like it.

Obviously, there may be several opinions as to which is the right way to do a certain job in the shop, but the machinery builder should have had sufficient experience, backed up by scientific tests, to be certain of his ground. With such assurance his salesmen and engineers should be able to convince the customer who insists on traditional practice and rule-of-thumb methods that the newer ways are really better.

# · SHOP · EQUIPMENT · NEWS ·

## Grant No. 4 TM Double-End Automatic Threading and Chamfering Machine

A DOUBLE-END automatic chamfering and threading machine that will handle work from 7 in. to 6 ft. in length and from ½ to 2¼ in. in diameter is being placed on the market by the Grant Manufacturing & Machine Company, Bridgeport, Conn. Besides chamfering and threading, the machine will also do hollow milling, working on both ends of the piece at the same time.

The machine, known as No. 4 TM, is shown in Fig. 1, and is essentially the same in principle as the smaller double-end automatic machine of this company, but incorporates a complete redesign for adaption to larger work. The bed is a one-piece heavy casting having scraped ways the full length for the movement of the heads. These heads are operated by large cast-iron cams which are adjustable on the cam shaft on the front of the bed. The rollers attached to the heads are of hardened steel. The spindles are driven by continuous-tooth herringbone gears insuring smooth action.

The operations performed by the machine include hollow milling, threading, chamfering, and drilling on opposite ends of such parts as rods, spindles, or tubes. Both ends of the piece are operated upon simultaneously, and one end may be milled while the other is threaded. The rods are fed from the magazine by the positive action of arms operated from the cam shaft so that only one piece at a time can drop into the jaws. The forward jaw is then advanced by the cam and, when the work is gripped, the tools are advanced by the forward movement of the heads. When the operations are complete the tools are returned automatically to a point which permits the necessary clearance. The machined rod is then ejected by two spring plungers on the jaws. The cycle is fully automatic and positive. A safety clutch is provided so that if the work jams, the working parts of the machine will stop. The guaranteed production of the machine illustrated when working on the chamfering of 2¼-in. tubes was 700 an hour.

The magazine is adjustable for all diameters within the range of the machine. The heads are adjustable along the ways to suit different lengths of work. Plates for the driving cams, shown in Fig. 2, are screwed to the cam drums, and can be readily changed for different jobs. The center bearing and the end bearings on the camshaft are fixed, but the shaft is also provided with two sliding bearings which can be locked in position alongside the cams to take up the thrust and prevent any deflection. To prevent wear on the camshaft, the sliding bearings are fitted with splined bushings that turn in the bearing brackets. Cams on the camshaft give a positive backward motion to the magazine, but the forward movement is controlled by heavy springs so that there is no danger of breakage if anything goes wrong with the feeding of the bars. The magazine slides are pack-hardened, and the jaws are of tool steel.

A 5-hp. motor, located under the machine bed, furnishes the drive and operates through a silent chain and gears on the drive shaft located on the rear of the machine. The speed of the machine is changed to suit different work by changing the gears on the drive shaft. The spindles are driven in a constant ratio by gears from the drive shaft. The drive shaft is splined its entire length to accommodate the movement of the heads. An oil pump supplies coolant through the spindles to the tools. The spindles are equipped with sight-feed lubrication.

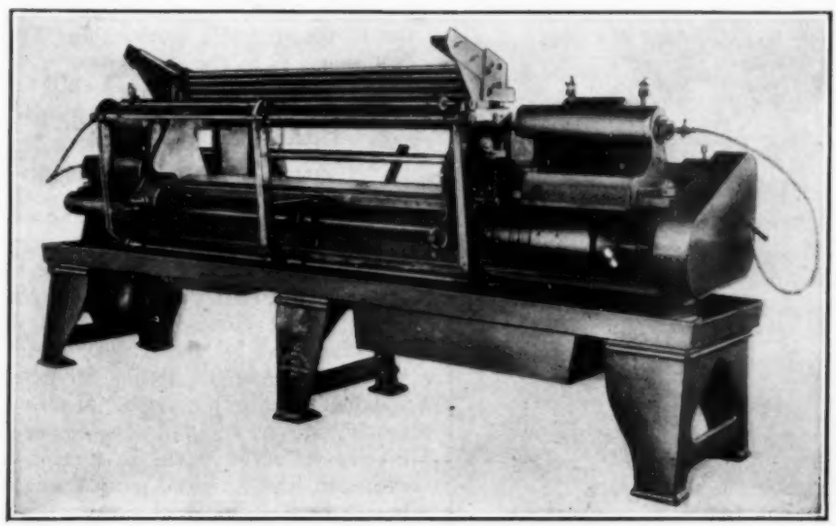


*Fig. 1—Grant No. 4 TM Double-End Automatic Threading and Chamfering Machine*

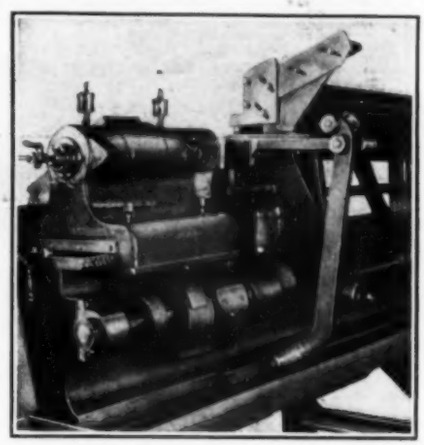
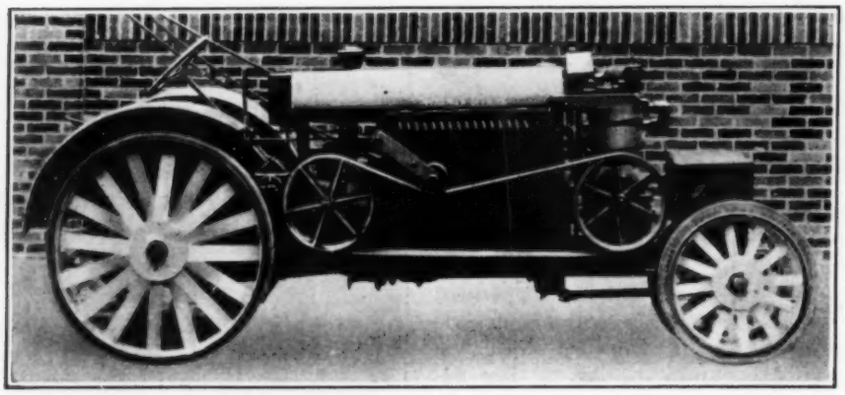


*Fig. 2—End view showing head-driving cam and magazine feed*

## Pontiac Tractor-Mounted Air Compressor

This self-propelling, four-wheel air compressor unit, capable of hauling heavy loads behind itself, has been placed on the market by the Pontiac Tractor Company, Pontiac, Mich. The compressor used is a Quincy type W-4 of 124 cu.in. displacement.



*Pontiac Tractor-Mounted Air Compressor*

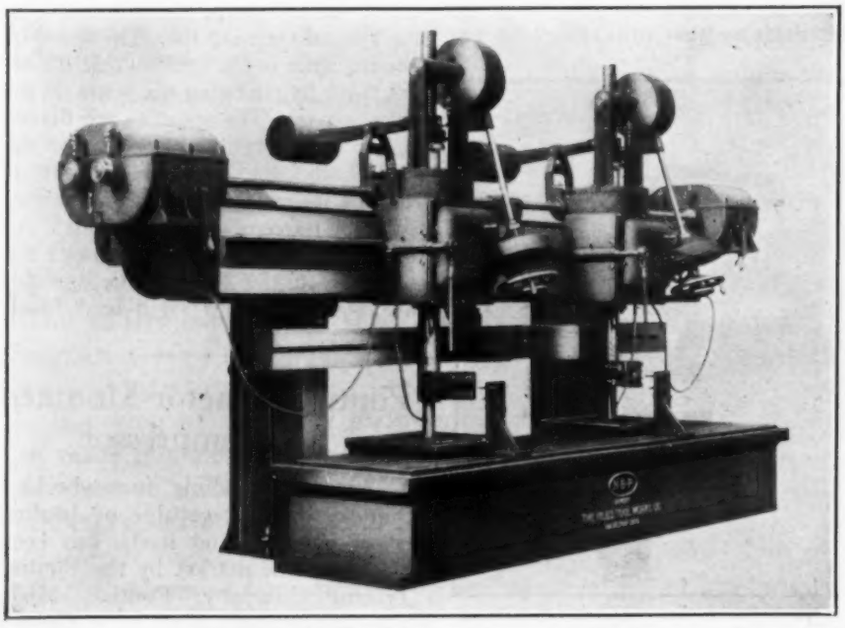
It has a separate radiator with pump-driven circulation.

The compressor has a three-bearing crankshaft and force feed lubrication. This unit with air tank and tool box is mounted on a frame which attaches either to the McCormick-Deering or Fordson tractors. Power is taken from the tractor to drive the compressor through a clutch. A belt tightener is used on the driving belt to maintain the proper tension.

## Niles Two-Spindle Heavy Rod Borer

BORING and facing operations on locomotive connecting rods can be performed on the two-spindle rod borer which has been placed on the market by the Niles Tool Works Company, Division of the Niles-Bement-Pond Company, Hamilton, Ohio. Each spindle on this machine is driven by an individual variable-speed d.c. motor of 15 hp., giving spindle speeds ranging from 8 to 140 r.p.m. The motors are mounted back of the crossrail, one on each end, and are connected to the spindles through gear boxes. The gear boxes transmit power to the bronze wormwheels on the spindles by means of steel worms. Ball thrust bearings are provided on the worms, thus making a smooth drive suitable for heavy trepanning.

High-carbon hammered steel is used for the spindles which have diameters of 5½ in. at the driving gear, and 8 in. at the lower end. They are counterweighted and have hand adjustment by means of conveniently located handwheels. The lower ends are bored for No. 7 Morse taper sockets. Vertical travel of the spindles is 22 in., and in addition to rapid hand adjustment, they are provided with a fine hand feed and six automatic gear feeds ranging from 0.005 to 0.165 in. per revolution.



*Niles Two-Spindle Heavy Rod Borer*

The spindle saddles are adjusted along the rail by rack and pinion, to a minimum distance of 36 in. and a maximum distance of 14 ft. 2 in. between spindle centers. The maximum distance from the top of the table to the end of the spindle is 30 in. The main table is provided with key slots for clamping the work, and also with a coolant trough. Coolant is returned by this trough to tanks in the base, from whence it is re-circulated by means of two independently-driven pumps. Two movable work tables are provided with bushed holes which are used to pilot boring bars at their lower ends. These tables are tongued and grooved to the main table, and have means for clamping them in position.

Supports are bolted to the lower crossrail for steadying the ends of spindles when using trepanning cutters or box tools. These spindle guides may be moved out of the way, and the rail elevated, so as not to interfere with the use of piloted boring bars. For machining bosses on certain types of rods, each spindle is equipped with a facing head having a pilot bar which is guided by a bushing in the movable work table. The feed wheel is of the star type.

## Paasche "Lo-Hi" Pressure-Feed Airbrush

By the use of interchangeable adjustable spraying heads, a wide range of spraying operations can be covered by this "Lo-Hi" pressure-feed airbrush. The complete apparatus is manufactured by the Paasche Airbrush Company, 1909 Diversey Pkwy., Chicago, Ill. These "Multiple-heads" are made in five sizes, each in five different types, so that light stains to heavy plastic paints can be handled. The width of spray obtainable varies from a fine line to a smooth spray 24 in. in width, accord-

*Paasche "Lo-Hi" Pressure-Feed Airbrush mounted on a cover interchangeable with 1-pt. and 1-qt. paint cups shown in phantom*

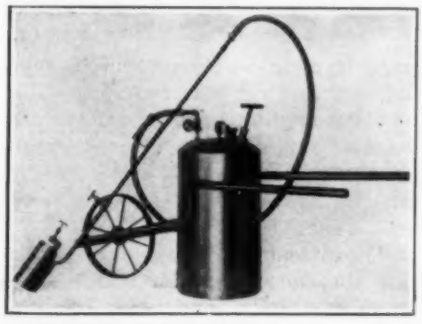
ing to the head used. Air at pressures of from 6 to 125 lb. can be used.

The illustration shows a Lo-Hi airbrush mounted on a cover which is interchangeable on a 1-pint or 1-quart pressure-feed cup. A pressure gage is included. A swiveling slanting inlet permits rapid flow of paint into the airbrush, and lumps or skins can be blown back and out. The two-finger steel trigger gives light control. Placing the air inlet at the back keeps the hose away from the work. All working parts are of hardened steel, while the body is of brass. Standard threads are used on all connections.

## Chausse Kerosene Burner Wheelbarrow

This portable kerosene burner, which is suitable for preheating prior to welding and other applications where an intensely hot voluminous flame is desired, is being introduced by the Chausse Oil Burner Company, Elkhart, Ind. The wheelbarrow type of mounting permits one man to easily transport the apparatus.

As shown a conventional type, welded steel tank with a capacity of 14 gal. of kerosene has attached to it the kerosene burner by means of a heavy flexible hose. The burner is of steel, with a wooden grip and convenient needle valve. The tank has a self-contained air pump and pressure gage. This burner is self generating and produces a flame having a temperature of from 1,750 to 1,800-deg. Fahrenheit.



*Chausse Kerosene Burner Wheelbarrow*

## Cleveland Circular Relief Grinder

CIRCULAR relief grinding of various tools can be performed on the machine introduced by the Cleveland Tool Engineering Company, Main and 25th Sts., Cleveland, Ohio. The outside face of the grinding wheel is dressed to the curve desired back of the cutting edge on the tool. In grinding, the tool is offset from the wheel to give the desired clearance. It is then ground to the cutting edge in one operation. The degree of clearance is determined by the distance the tool is moved in or out against the curve of the grinding wheel. Such tools as reamers, milling cutters, face mills, boring heads and core drills can be handled.

A heavy cast-iron base supports the machine. The table, which has a maximum travel of 26 in., carries one adjustable and one fixed center rest. The adjustable center rest provides a frictionless scale-point center, a quick-acting spring-tension center, and a screw for raising the center used for grinding plain tapers. An adjustable positive stop is located below the spring-tension center for back tapers. The table is elevated by a screw whose movement is graduated in ten-thousandths of an inch. The cross-slide screw is graduated in thousandths of an inch. A camholder is placed at the front of the slide for any desired curve, angle, flat or back taper. The motor is mounted on a slide that is adjustable in the direction of the table traversing movement. A graduated, adjustable diamond wheel dresser is provided directly over the grinding wheel. Swiveling of the head can be measured in degrees. All adjustments are simply and easily made.

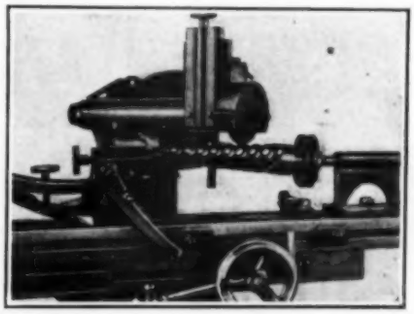


*Fig. 2—Cleveland circular relief grinder shown performing a difficult operation*

The floor space required by the machine is 2x6½ ft., and the weight is 600 pounds. A swing of 7 in. on centers is the maximum for this grinder.

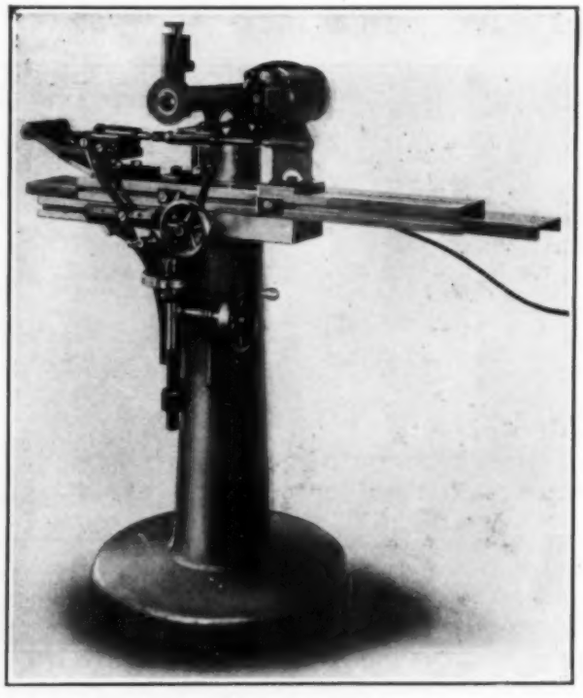


*Fig. 1—Cleveland Circular Relief Grinder*

# Cleveland 5-Ton Arc-Welded Overhead Traveling Crane

ARC-WELDED joints are a feature of this overhead traveling crane, designed by the Cleveland Crane and Engineering Company, Wickliffe, Ohio. The illustration shows a 5-ton crane having a span of 38 ft. 9¼ in. It is of the I-beam girder type. The girder is reinforced along its entire length by angles arc-welded to the standard I-beam sections. The girders are attached to the end trucks by the notched construction to prevent weaving. To facilitate shipping the girders and trucks are disassembled. In the field they are connected by means of bolts, but arc-welded reinforcement is recommended to secure maximum rigidity.

The end trucks are built up of two standard channel sections joined by arc welding. Roller bearings are used, thus permitting rapid acceleration and lower power consumption. Each trolley frame is made of a standard channel with welded braces under each bearing point. Fig. 2 shows the gear guards, which are also joined by this method. This process is also used to join the hand rail on the foot bridge and to build up the bearing supports for the bridge drive shafts. The advantages claimed for this type of construction are: A more efficient distribution of weight is made possible; moving parts are lightened, thus obtaining greater acceleration.

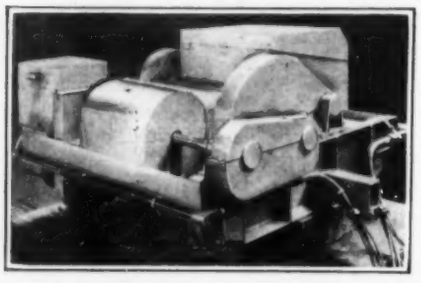


*Fig. 2—Arc welding has been employed in the fabrication of the gear guards*

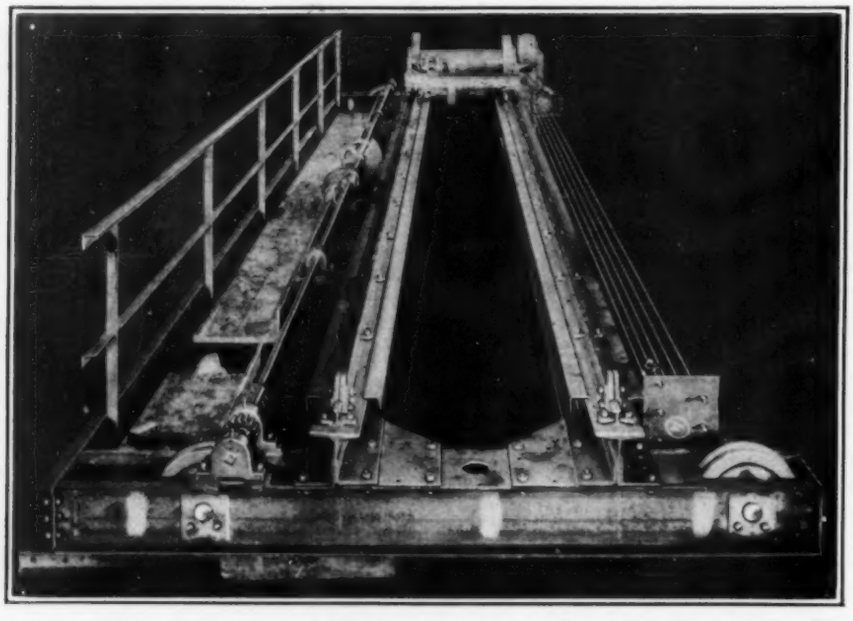


*Fig. 1—Cleveland 5-ton crane of the I-beam girder type built up by means of arc welding. The span is 38 ft. 9¼ inches*

# "Micro-Poise" Balancing Machine for Automobile Wheels

Automobile wheels equipped either with or without tires can be balanced on this "Micro-Poise" balancing machine which has been placed on the market by the Commerce Pattern Foundry & Machine Company, 2211 Grand River Ave., Detroit, Mich. The work to be balanced is placed on the machine, the operating lever is moved, and a universal level shows instantly the angle of unbalance. Weights are placed on the rim to compensate for the amount of unbalance, and the size and location of the weights is then marked on the tire. After this procedure the wheel is removed.

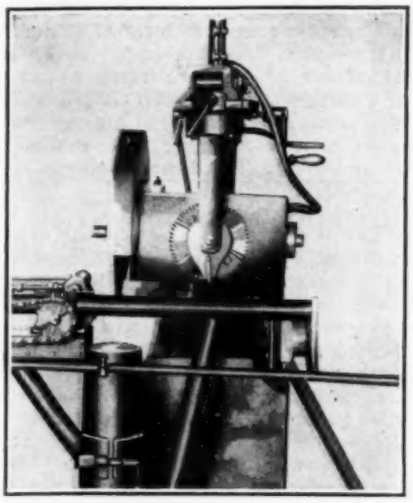
*"Micro-Poise" Balancing Machine for Automobile Wheels*

Because of the fact that there are a limited number of holes provided in the rim for attaching the balance weights, it is sometimes necessary to attach more than one weight at the same points. The machine is adapted to this practice. Production is quoted at 60 balanced wheels per hour.

# De Walt "Wonder Worker" Overhead-Drive Cut-Off Saw

Many cutting operations can be performed with the aid of this "Wonder Worker" cut-off saw manufactured by the De Walt Products Company, Leola, Pa. These operations include crosscutting, ripping, mitering, dadoing, disk sanding and grinding. In addition, the machine is suitable for cutting steel tubing used in airplane manufacture, since it is adjustable to any angle. For such work a 12-in. metal-cutting saw having hollow-ground fine teeth has been found suitable.

The machine consists of a motor unit suspended in a yoke which slides in an arm. The motor may be tilted through a wide angle which can be



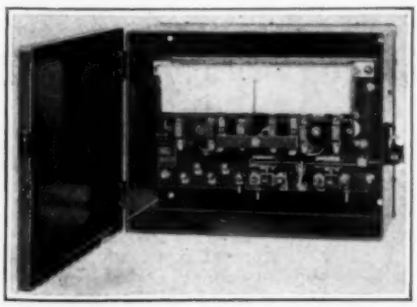
*De Walt "Wonder Worker" Overhead-Drive Cut-Off Saw shown cutting steel tubing used in airplane manufacture*

measured by the use of a protractor attached to the yoke. Both the arm and the upright can be swung through a complete circle. The stroke of the saw is effected by pulling it out on the arm. In addition, the whole unit can be raised or lowered. These movements permit the machine to operate saws or other wheels at any angle.

Nine models are available. The motors used operate on 110- or 220-vole a.c., 60 cycles, as desired. Capacities vary from 1 to 5 hp. The saws used are from 12 to 16 in. in diam. Extra equipment includes a control switch and a table mounting.

## I-C Automatic Reversing A.C. Starter

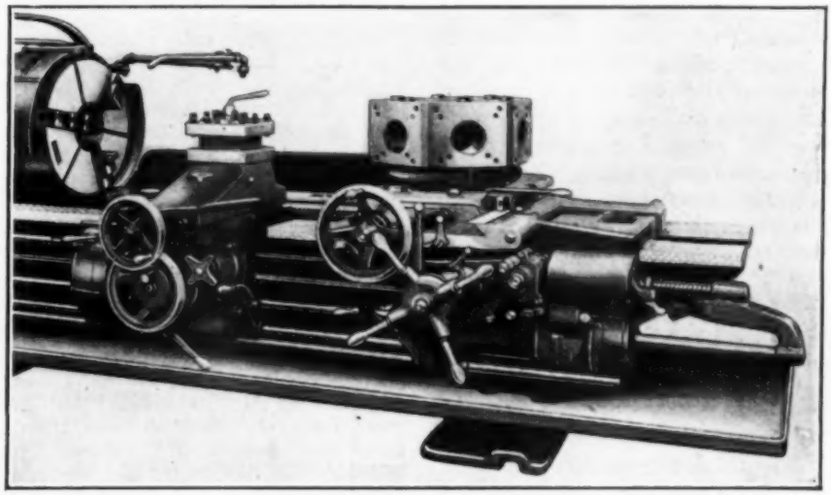
Remote control, low-voltage and overload protection are provided by this starter intended for a.c. circuits which has been introduced by the Industrial Controller Company, Milwaukee, Wis. The device is made for all usual voltages and for either two- or three-wire control. It is rated at 15 amp. The Class 8732 starter has two mechanical interlocked contactors, and is provided with thermal-overload relays. Class 8712 is of similar construction, and is furnished without overload relays. The mechanism of either type is entirely inclosed in a steel cabinet, which has a baked enamel finish.



*I-C Automatic Reversing A.C. Starter*

## Cross-Sliding Turret for "Libby-International" Lathes

THE "Libby-International" heavy-duty turret lathe may be equipped with this cross-sliding turret which has been developed by the International Machine Tool Company, Indianapolis, Ind. The application of this turret makes lathes so equipped suitable for either quantity or small-lot production, and also is adaptable to maintenance work. Special tools are not required.



*Power Feed Cross-Sliding Turret applied to a "Libby-International" Heavy-Duty Lathe*

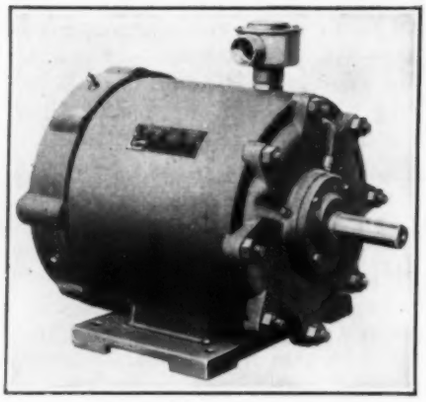
Heavy, gibbed tri-way bearings and the turret slide made in one piece over and under the back way insure rigidity of the turret. The tri-way bearings are adjustable for wear, and a long taper gib runs the entire length of the slide. The turret has power cross and longitudinal feeds which are independent of each other. They are also independent of the quick traverse or of the toolpost carriage. Automatic trip-offs for the cross feed are provided.

Both the toolpost and turret carriages are provided with large dials for easy measurement of the longitudinal and cross feeds. The bottom slide is provided with a scale to show the exact position of the turrent head in relation to the spindle. A heavy taper attachment for the turret is included. This device permits changing from straight to taper work by merely withdrawing a pin.

This power feed cross-sliding turret can be applied to the heavy-duty lathes which are made in five sizes. The smallest size has a swing of 22½ x24 in., and will accommodate a 3½- or 5-in. spindle bore while the largest size has a swing of 30x32 in., and will accommodate 8¼-, 10½- or 12½-in. spindle bores.

## Allis Type EX Explosion-Proof, Self-Ventilated Motor

Light weight and usual space requirements are the features of this explosion-proof, self-ventilated motor which has been developed by the Louis Allis Company, Milwaukee, Wis. For example, a 5-hp., 1,750-r.p.m. motor weighs but 33 lb. more than an open-type motor of the same

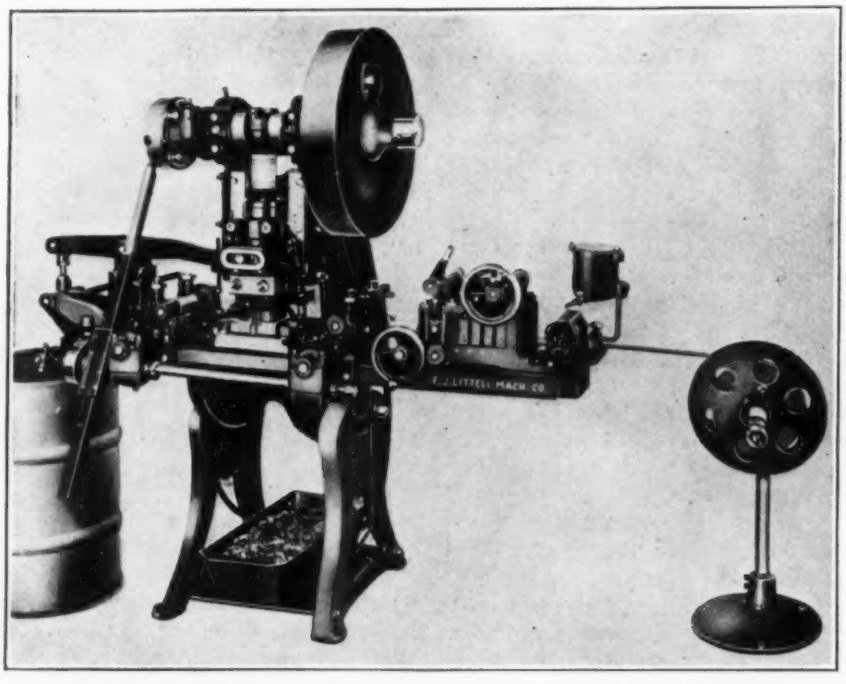


*Allis Type EX Explosion-Proof, Self-Ventilated Motor*

rating. This motor has received the approval of the Underwriters' Laboratories and is suitable for applications where explosive mixtures of the fumes of gasoline, naphtha, acetone, and alcohol are present. No special mounting provisions are required. This motor is available in sizes up to 5 horsepower.

## Littell Nos. 2 and 3 Stock Straighteners for Punch Presses

Springy roll stock may be straightened by these two mechanisms which have been developed by the F. J. Littell Machine Co., 4125 Ravenswood Ave., Chicago, Ill. The No. 2 straightener is arranged with a hand-driven feeding mechanism, so that it need not be used with a roll feed, although this is entirely possible. The apparatus may be supplied with an oiler if desired. It has nine rolls which are small and set close together, and will accommodate stock 3½ in. in width. The No. 3 size is similar to the No. 2, except that it has seven rolls, and will accommodate stock up to 5 in. in width.



*Littell No. 2 Rack and Pinion Feed equipped with a No. 2 Roll Hand Feeding straightener and Scrap Cutter*

## Trade Catalogs

"CANCO" PRESSES. The American Can Co., Equipment Division, 120 Broadway, New York City, has published Bulletins 4041 and 4042. The first describes toggle presses and the second shows horn and apron presses. Specifications of both presses are given, and both are illustrated. Bulletin 4042 also gives specifications for arch and screw presses.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued a series of pamphlets. Bulletin 457A shows squirrel-cage induction motors having riveted frames. They are of the "900 series," two- and three-phase, and built in sizes from ¼ to 15 hp. Bulletin 714A shows Type MD-400 mill motors for d.c. operation on cranes, hoists, shovels and bridges. Catalog 869 describes Type CR 7006-D31 magnetic switch for a.c. motors, in three-pole, 150-amp. sizes. Bulletin 961 shows sheath-wire resistor units for cable reel motors such as are used on mine locomotives. Catalog 994 shows a travel carriage for automatic arc welders having either a single- or double-welding head.

"GUNITE" METAL. The Gunite Corp., Rockford, Ill., has published a booklet on "Gunite" metal or pearlitic steel having graphite flakes distributed throughout the ferrous matrix. Several microphotographs show the structure of this steel. A table supplying the physical properties of Gunite metal and other steels and cast iron is included.

HACKSAW BLADES. The Arion Steel Co., 85 Purchase St., Boston, Mass., has published a leaflet showing "Triple-Ife" hacksaw blades which are made for hand and power operation. These saw blades, made in various types, are made with various numbers of teeth suitable for several types of work.

INDUSTRIAL SIGNALS. The Benjamin Electric Mfg. Co., 120 S. Sangamon St., Chicago, has published Bulletin 54, showing various types of industrial signals and wiring diagrams thereof. The line includes industrial howlers, relay panels, visual signals, and push buttons. The constructional features and sizes of each are given. The catalog is well illustrated throughout and contains sixteen 11x8½-in. pages.

MAINTENANCE MATERIALS. The Stone & Tar Products Co., 97 S. Sixth St., Brooklyn, N. Y., has published a bulletin entitled "Repair & Maintenance Review" showing concrete hardeners, rust preventers, pointing cement, damp-resisting paint, caulking compound, protective coatings, and waterproofing materials. The catalog contains 42 6x3½-in. pages.

OXY-ACETYLENE EQUIPMENT. The Oxweld Acetylene Co., 30 E. 42nd St., New York, N. Y., has published a catalog showing oxy-acetylene equipment for welding, cutting, brazing, lead burning, heating and decarbonizing. All of this material is illustrated and the specifications are given. In addition low-pressure acetylene generators in various sizes and supplies are described. The catalog contains 56 9x6-in. pages.

RAILROAD AND INDUSTRIAL SHOP EQUIPMENT. The Niles-Bement-Pond Co., 111 Broadway, New York, N. Y., has published a catalog entitled "On Land-On Water-In The Air," which shows various types of machine tools and other equipment used in railroad shops, automobile shops, and marine engine shops. Various small tools and measuring equipment are also described and shown.

# NEWS OF THE WEEK

## Low Accident Rate Is Found to Accompany High Production

High production goes hand in hand with low accident rates according to data obtained by a committee of the American Engineering Council from 13,898 plants over a period of six to fifteen years. Largely because of the emphasis placed upon safety measures in the past few years, a majority of the industrial groups studied showed an accident decrease from 1922 to 1925 bases upon the hazard to workman per unit of production. Production was increased so rapidly, however, that there were actually more accidents in this period than ever before.

The greatest increase in accidents, 50 per cent, was reported for this period from the knit-goods industry, while, conversely, wire and wire products companies showed the greatest decrease, 89 per cent. Eight other groups showed increases in both the severity and frequency of accidents. They were: automobiles; brass, bronze and copper products; cotton goods; fine specialty machines; writing paper; lumber; textiles; valves and fittings.

### Improvement Shown

A much larger number showed improvement in both accident severity and frequency. Besides the wire field, they were: acids and heavy chemicals; agricultural implements; bleaching and dyeing; boilers; cement; electric light and power; electric railways; explosives; gas; machine building and metal working; paper boxes; paper, pulp and paper products; sheet-metal products; tobacco byproducts, and wrapping paper.

Of 688 accidents analyzed, there was an average of 33 hours lost per man per accident. Not only was the injured man himself kept from work by his misfortune, but his fellow-workers who crowded around to see what had happened to him were also hindered. Of 76 accidents studied, this number of fellow-workers temporarily stopping their work was nine, and they lost among them 6 hours per accident.

It was found that machinery was responsible for 56 per cent of the trouble in terms of productive hours lost; handling of objects, 21 per cent; falling objects, 10 per cent; and flying particles, 8 per cent.

In analyzing accidents by departments, machine shops headed the list with more than 50 per cent. However, they resulted in but 19 per cent of the total time lost, that is, were less severe than accidents occurring in other departments, notably foundries, where the average accident cost 40 per cent of the time lost by all other accidents put together.

The fact that in this analysis, the foundry accidents constituted only 8 per cent of the total, emphasizes the importance of studying the effects of accidents rather than their total number. One serious accident may do more damage to industrial efficiency and general morale of the factory than a dozen minor ones.

Further analysis of the distraction to non-injured employees when accidents occur revealed that, on the average, 58 were kept from work when some one was killed in the plant; 18, when a limb was so badly hurt that it had to be amputated; 9, when a fellow-worker got something in his eye, and so on down the list.

The most frequently injured part of the body, the same analysis developed, was the fingers, with 89 accidents reported for them. The loss of production due to them was high, $78.49 per accident, which, considering the frequency with which fingers are caught in machinery, makes this type of accident an important one to minimize. Accidents to arms caused the highest net loss per man, $112, but as there were only four of them reported, their importance was less. Injuries to eyes ranked next in number to finger accidents, 79, but their loss was considerably less, $17 per accident.

In summarizing its report on individual accidents, the committee said that there are few companies that keep data on the production losses, consequently the difficulty of studying the problems was increased.

### Incidental Losses High

The incidental or accompanying losses due to industrial accidents are an appreciable amount, probably much greater than is commonly recognized, and perhaps of considerably greater magnitude than indicated by this study. Minor accidents, those causing a disability not exceeding the day shift or turn in which the accident occurred, are more important from the standpoint of incidental loss than is generally realized. This is true because of their relative frequency. In a two-months' period, one company experienced 37 major and 1,153 minor accidents. The productive lost time due to the minor accidents was three and one-half times that due to the major accidents. The loss of production value due to the minor accidents was approximately three times that due to the major accidents.

## Factory Buildings Cost 23 Cents a Cu.Ft.

According to James A. Burbank, vice-president of the John W. Ferguson Co., the modern type of American factory can now be built for about 23 cents a cu.ft., assuming level ground, normal foundation conditions and average equipment.

American factory buildings of today are mostly of reinforced concrete with flat slab ceilings (no beams or girders) permitting uninterrupted distribution of light and low cost installations of sprinkler equipment and shafting, according to Mr. Burbank. Ceilings heights are about 12 ft.; columns are usually 20 ft. apart; floors are designed to sustain a working load of 125 lb. per sq.ft., and are cement finished.

Factory-type steel windows with ventilating units fill about 50 per cent of the wall area. Interior walls are cold water painted, but if especially good illumination is desired, oil paint is used. For artificial illumination, one watt per sq.ft. of floor space is average. Sprinkler equipment is usually one head for each 90 sq.ft. of floor area. Plumbing varies with number of employees and with State and Municipal requirements. Partitions are mostly hollow tile, 4 to 6 in. in thickness.

Elevator equipment is generally one 3,000-lb. capacity car for 100x100-ft. building; two cars to 100x200-ft. building. The height of first floor is about 4 ft. above ground to facilitate unloading from box cars and trucks.

## Mill Supply Association Being Voted Upon

Members of the three mill supply associations, the National Machinery Distributers Association, the Southern Supply and Machinery Dealers Association, and the American Supply and Machinery Manufacturers Association, are now being balloted by mail on the question of forming a joint association to be known as the Mill Supplies Association of America. A copy of the proposed constitution and by-laws together with a letter of explanation is now in their hands. This material was prepared by a joint committee that met in Cincinnati on July 2. The committee was selected at the joint convention of the associations held in June. The ballot is returnable to George Puchta, representing the National group and chairman of the special committee, Pearl and Elm Sts., Cincinnati, Ohio.

# *The Business Barometer*

## The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

*Editor, Commerce and Finance, New York*

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FOR a time last week, business seemed to be impinging upon politics, but the situation was cleared by Mr. Raskob's withdrawal from the General Motors Company, and those who feared that the Presidential campaign might interfere with trade are reassured.

This reassurance was reflected in the stock market, where prices were slightly higher, but there has been no excitement, and a revival of the speculative boom seems to be unlikely, at least until there has been a further and a more substantial reduction in brokers' loans. Last week's decrease in these lendings, as reported by the Federal Reserve Bank of New York, was only $11,000,000. This was much below anticipations, but the market effect of the report was negligible. It shows that the New York banks are lending really less than last year on securities, and that $1,808,000,000, or nearly one-half of the total brokers' loans, is being lent for the accounts of corporations, firms, and individuals who prefer to use their surplus funds by lending them on call, instead of allowing them to lie in the bank at low rates of interest. As it is unlikely that these funds would be loaned to commercial borrowers in any event, their employment in Wall Street can hardly be regarded with disfavor. The effect of the bank showing has, however, been negative rather than positive, and call money is still comparatively scarce, although the rate has not risen above 5½ per cent.

But there is no denying a moderate improvement in distributive trade. It is confirmed by the car loadings, which continue to run slightly ahead of last year, as well as by mail order sales, and the reports published by the various chain store organizations. Prices are not, however, as yet higher, and most of the speculative commodities are lower than they were at the beginning of the week. Sugar has also turned weak again, and rubber has been less firm than it was. Both these commodities have become accustomed to government support, and seem to be unable to sustain themselves without it.

An improvement in the price of raw wool has been partially nullified by the action of the largest manufacturer in reducing the price on some lines of woolen fabrics, and many consumers are coming to believe that it is a buyers' market. Cotton futures were rather easy early in the week, but sellers seemed inclined to cover as October approached 20.60, and a further decline appears unlikely, at least until the issuance of the government report on August 8th. In the meantime, a slight improvement in the market for cotton goods has developed as short time and the New Bedford strike are beginning to work a perceptible reduction in unsold stocks.

The steel industry is distinctly better. Copper continues firm, and a famine in tin is again being talked of. The oil business is also looking up. Production seems to be under control. Consumption is increasing, and the Standard Oil Company of New York has announced an advance of 1c. per gallon in the price of gasoline in the metropolitan district. Great activity in new construction is also reported, and all sorts of building materials are in good demand. This is particularly true of lumber. The automobile industry is also in a cheerful mood. It is said that sales exceed expectations, and that the road building plans in the United States for the next three years will cost a sum so large that it seems unsafe to give the figures until they can be verified.

There is no doubt that the insatiable demand for tax-exempt bonds has made it very easy for cities, towns, counties and road districts to borrow, and that they are undertaking public improvements that were undreamed of thirty years ago. As a result, there is work at good wages for every able-bodied man, and all talk of unemployment has subsided.

It is indeed a cheery prospect, in which the cheap money that we had until recently appears to be the energizing factor. It is, therefore, very important that the supply of commercial credit should be unimpaired, and for this reason it will be wise to keep a careful eye on the Federal Reserve statement and all the other indicia of the financial situation, as they appear from week to week. If they continue to show a gradual liquidation of securities, there will be no reason for concern about the immediate future. But if there is a revival of the stock exchange speculation, and a concurrent increase in brokers' loans, the brilliant promise of the present may fail of fruition in the autumn. There is, however, no doubt that the financial and commercial situation is much better balanced than it has been for some time, and that business men are now justified in going ahead with confidence, provided they watch the signals and slow down whenever caution is suggested.

The outlook in Europe is also encouraging. The stabilization of the French franc has brought out much hoarded gold, and confidence seems to be completely re-established. In Lancashire a cotton operatives' strike impends, but, if it occurs, the result will be a reduction in the supply of manufactured goods and "buy on strikes" is an old proverb in the English cotton trade. Elsewhere in Great Britain business appears to be improving, and the London markets are cheerful.

In China, the hope of political nationalization seems to be nearer realization, and even Russia is featuring Communism less prominently than she was.

### WHAT'S DOING IN INDUSTRY

**REPORTS from several centers this week indicate a distinct revival in business, and even in those centers where dullness is evident, conditions in the machine tool market are much better than for the same period last year. Everywhere considerable optimism is expressed as to future business, which is expected to materialize in a big way after Labor Day. For the first time there is noticeable mention of foreign markets.**

**IN CINCINNATI, the sales curve ascended in the past week, and the season is the best, as far as orders go, in some years. In Milwaukee, also, there has been a distinct revival of business, and general production is above the average. Buffalo reports unexpected activity, while in New York an unusually active summer is made even more active by purchases made by the Wright Aeronautical Corporation in the past month amounting close to $500,000. Victor Talking Machine Co. buying is the high light of the Philadelphia market, a spotty one in other respects.**

**FEW ORDERS for tools are reported in New England, but general industrial conditions there as elsewhere are said to be very active. In Chicago, sales are not quite as high as in June, but are very satisfactory for the season. Both Detroit and Cleveland report a slowing up, although certain lines of machine tools in the latter district are selling well. Big developments are expected in Detroit in the early fall due to automotive activity. Railroad buying is dormant for the present, but is expected to develop soon.**

# *The Industrial Review*

## Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

### DETROIT

Conditions in Detroit and the Detroit area have undergone little change within the past week or ten days. There has been a decided slowing up during the latter part of July, and it is more or less generally believed the slump will continue through the greater part of August. A few orders are still coming through, however, and a number of inquiries are being received.

The belief prevails here that September will bring a really substantial development. Nearly all of the major automobile organizations are planning comprehensive changes in their models. Buick has already announced its new line, Chevrolet is making plans for a greately increased output, and Oakland, Pontiac, Oldsmobile and others are planning increased production and some changes.

The general feeling here is very good in spite of the summer slump. Business in other lines is fairly good. Employment is keeping up very well.

### PHILADELPHIA

Purchase of quite a substantial list of mechanical equipment by the Victor Talking Machine Co., of Camden, was the high light in the Philadelphia machinery and machine tool market during the last two weeks. The list included milling machines, punch presses, automatic screw machines, Syracuse presses and other equipment.

Dealers in and manufacturers of ball bearings reported that the midsummer business in that line has kept up remarkably well with indications favorable for an indefinite continuance. The automobile industry from Detroit has been rather substantial purchasers of that equipment and some business has developed from airplane manufacturers, according to reports.

In the other machinery lines reports of spotty conditions continued to dominate. Many of the officials of machinery and machine tool concerns in this area are away on vacation, and the exact situation was difficult to ascertain. Reports from custom automobile body builders indicated a rather substantial list of sales. Sales of used machinery continued dull, and inquiries generally appeared to have suffered a falling off.

### NEW YORK

While purchases by the Wright Aeronautical Corporation dominated the machine tool market in New York as they have done for the past few weeks, general buying was well above the average for this period. For at least two concerns, both of whom had not shared in Wright business, July was one of the best months this year, as far as orders were concerned. One of these concerns handled engine lathes, the other a general line. Among the Wright purchases were 27 Gisholt turret lathes, two LeBlond automatic lathes, one Oesterlein offset miller, and a miscellaneous quantity of small equipment.

Business in July was well above that of the same time last year for nearly all dealers and factory representatives, and there was considerable optimism expressed as to the future. It is expected that the last six months of the year will prove even more active than the first six. There is every indication of a pickup in general industrial activity, and companies that have been dormant for some time are beginning to show signs of life. Certain builders of large equipment, however, are rather disappointed in present sales, although one such concern is finding an active market in this vicinity. Railroad buying, either in New York or outside, is conspicuous by its absence, although there are several inquiries out from the N. Y. Central and the Erie R.R. Opinion is divided as to the sale of portable tools, one representative reporting a very good month, another a poor one compared to June.

Sales made by the Pratt & Whitney Co. during the past week included two 13-in. lathes, two 16-in. lathes, two 6-in. vertical shapers, and two No. 12 profilers. The Niles Tool Works Co. sold a 5-ft. Straightline radial drill, a 6-ft. universal Straightline radial drill, and a 73-in. boring and turning mill.

### BUFFALO

Somewhat unexpectedly, reports indicate some improvement during the last two weeks in all branches of the machine tool and industrial equipment trade. Whether this will continue or not is uncertain, but it is certain that July is proving to be a better month than that of last year.

Much machine tool business is in standard equipment, as is most of the electrical equipment business, although in the latter some large jobs are in sight. Demand for contractors equipment still holds up well.

### CHICAGO

The closing days of July find the machine tool market not quite so active as it has been for the last three months, yet, the season considered, distinctly satisfactory. Reports from district representatives and local dealers are to the effect that business this month will compare favorably with June, being only slightly less in volume. Taking advantage of the easing off of demand, machinery executives and department heads are preparing for their annual vacations, some already having left the city.

It is confidently expected by those in intimate touch with general industrial conditions that the month of August will show a continuance of good business in the machine tool industry. Agricultural implement and tractor builders still are buying shop equipment in fair volume. General industry also is an important factor in the market, its requirements including a diversity of standard tools. A normal amount of business is being done with automotive and auto accessory manufacturers.

Railroad buying is on a small scale, with no new lists in sight so far as can be learned. Used tools are in fair demand. Inquiries are being received in good number.

### CLEVELAND

Very little change was evident in the local machinery and machine tool market during the past ten days. In general, business was reported as quiet, one or two exceptions being noted however. A selling agent reported business as rushing with orders coming in from least expected sources. These purchases were made without much preliminary work. Punch and shear business showed a pick up. Automatic line reports fair business. Automobile accessory concerns were the chief source of revenue for the last mentioned division.

Sales are confined to single items, principally for replacement purpose. The Gabriel Snubber Co., it is reported, is planning to produce hydraulic shock absorbers, and a complete retooling program will be necessary if this change is made.

Export orders are reported from France and England.

### CINCINNATI

According to the reports of the great majority of the machine tool manufacturers in the Cincinnati district the sales curve ascended in a gratifying way the past week. "This is the best summer we have had in many years," said the head of one concern. "The week's sales showed an increase, a feature of the period being the closing of several orders that had been pending quite a while," stated another. "The market livened up considerably in the week, and prospects seem very encouraging, especially around Detroit," explained a third. The few concerns that did not have an increased volume of sales in the week report that they held their own.

Selling agents report that in the week business livened up in local and adjacent territory and state that their volume of sales showed a gain over the corresponding period of the previous year.

A feature of the week's business was the receipt of several export orders, among these being purchases made by users in Japan, Australia, France and other European countries. The greater portion of the orders received in the week were for single tools, coming from miscellaneous users, but scattered among them were orders for two or more tools. The week's sales were well distributed geographically and they were well diversified as to types and sizes. A small number of single orders were received from railroads and concerns in the automotive and allied industries.

The week's inquiries are reported to have been very satisfactory both in number and nature. The great majority were for single items. Taking the trade as a whole, there is now a more optimistic feeling than there has been for many years at this season.

### MILWAUKEE

Judging by the trend of local metalworking industry in recent weeks, a distinct revival is setting in and the tool trade is looking forward to a substantial volume of business. At the same time, local manufacturers of metalworking machinery report an improving inquiry from other industrial centers, indicating that the betterment in business is quite widespread. Meanwhile the number of new orders is relatively very satisfactory. Production in most shops is above the midsummer average, and at least one prominent manufacturer of tools finds it necessary to increase capacity in order to meet the demand.

Prospects for business from the automobile industry are deemed infinitely better than they were a year ago. At that time a steadily declining movement in passenger car production was setting in; at this time output schedules are on the upgrade, with authorities predicting that sales in the last half of 1928 will exceed those of the first half and run very substantially ahead of the same period last year.

The tractor and farm machinery indus-

try is still an active purchaser of production equipment, and a number of important factories in this locality are just entering a period of expansion after a period of waiting to see if the active call for products of their manufacture would continue and thus warrant additions to capacity.

It is to be noted that, specifically and generally, the demand for metalworking equipment is growing beyond the former limits of replacement needs, due to a resumption of industrial expansion. This is expected to be conservative and orderly, imposing so momentary strain on tool shops that would cut the production curve into sharp peaks and valleys, and thus upset an employment situation that is relatively satisfactory, with the demand for skilled help keeping the labor market better than even.

### NEW ENGLAND

The week has been disinteresting as regards new orders for machine tools in the New England section. Industrial conditions, however, are not affected and plants, with few exceptions, continue to function on close to full schedules. July business, as a whole was somewhat erratic, but the average volume of sales will be in excess of the corresponding month last year. Information at hand varies. One dealer reports a dull month, another finds July business better than June, when totals were favorably large. Builders of machinery anticipate figures comparable with the month of June.

During the week new business reported was confined to single machines. An eastern Massachusetts concern purchased a used universal milling machine and 18-in. engine lathe. The Commercial Aircraft Co. of America bought a fair amount of used equipment. A western Connecticut electric company is replacing a number of drill presses, another Massachusetts concern has received two of eight machines ordered from a German manufacturer.

Thompson Products, Inc., Hartford, is operating day and night. Its automobile business is at a high level, and the company reports a remarkable growth in the manufacture of airplane engine valves. Sales of contractors equipment and road construction machinery continue at a high level.

## Oil-Burning Airplane Engine

After more than five years of research and experiments, construction of a full-sized oil-burning airplane engine has been started in laboratories of National Advisory Committee for Aeronautics at Langley Field, Va. A refinement of the principle of the Diesel engine has been evolved whereby a power plant producing 1 hp. to 2 lb. or less of engine weight can be built. Two commercial airplane engine companies, Packard and Ford, are working on the problem.

## Low Record Established for Unfit Locomotives

Fewer locomotives were in need of repair on the Class I railroads of this country on July 1, than at any time since the compilation of these reports began, according to reports filed by the carriers with the Car Service Division of the American Railway Association. The number in need of repair on July 1, was 8,006 locomotives, or 13.4 per cent of the number on line. This was a reduction of 251 locomotives compared with the best previous record established on January 1, 1928, at which time there were 8,257 locomotives awaiting repairs, or 13.6 per cent. This number also showed a reduction of 753 compared with the same date in 1927, when there were 8,759 or 14.3 per cent.

Freight cars in need of repair on July 1, totaled 145,210 or 6.5 per cent of the number on line. This was a decrease of 2,780 under the number reported on June 15 last.

## French Engineers to See American Industrial Centers

An inspection trip of all the major industrial centers of the United States is being planned by the Compagnie Generale Transatlantique for French engineers. Besides plant inspections, the purpose of the trip will be to study the methods and the organization of the principal engineering societies. Prof. Robert Grimshaw of New York University has prepared the itinerary and has arranged for the reception of the visitors by the various manufacturers.

The party will leave France on October 13 on the steamship "DeGrasse," arriving in New York on the 22nd. Visits to the plants of the Knickerbocker Hotel and the Herald-Tribune Building have been planned for that day. The remainder of the time in New York will be spent in sightseeing and in visiting the A. T. & T. Building.

At Philadelphia the party will visit the Baldwin Locomotive Works, the Hess-Bright Manufacturing Co., the Link-Belt Co., Wm. Sellers & Co., the Niles-Bement-Pond Co., the Tinius Olsen Testing Machine Co., and the Victor Talking Machine Co. at Camden. En route to Pittsburgh, the engineers will see the sights in Washington. At Pittsburgh, the Westinghouse Electric & Manufacturing Co., and the Heinz food works will be visited.

Other cities and plants to be included are: Cincinnati: The American Tool Works Co.; J. A. Fay & Egan Co.; and others, depending on the time. Chicago: Plant of Hotel Bismarck; and the stockyards. Milwaukee: the Allis-Chalmers Manufacturing Co. and the Nordberg Co. Detroit: Fordson. Cleveland: the Warner & Swasey Co. and other plants. Providence: the Brown & Sharpe Manufacturing Co. Hartford: the Pratt & Whitney Co. The return will be to New York, from where the group will sail on November 14 on the "Rochambeau."

## Soviet Purchases Increase

Soviet-American trade for the first nine months of the Soviet fiscal year 1927-28 beginning Oct. 1, 1927, reached a total of $100,000,000. While a new record for Soviet-American trade was reached during the nine months ending June 30, 1928, the composition of the trade remained about the same as last year, according to M. G. Gurevitch, acting chairman of the board of directors of the Amtorg Trading Corporation, of New York. Raw materials, industrial equipment and agricultural machinery constituted the bulk of Soviet purchases here, while animal products such as furs, bristles and casings were the principal items of Soviet imports into this country. Total purchases were about $84,000,000 and sales $16,000,000. In the past two years industrial equipment became an item of increasing importance on the Soviet purchase list here. Orders placed for machinery and other equipment amounted for the past nine months to about $10,000,000 as against about $7,000,000 in the corresponding period of the preceding Soviet fiscal year. Purchases of agricultural machinery and supplies amounted to $8,771,593, also a considerable increase over last year.

## Shipping Tags to Be Simplified

At a preliminary meeting of manufacturers of paper tags held at the Department of Commerce, Washington, D. C., on June 25, a report was presented on the survey made through the offices of the Division of Simplified Practice at the request of the Tag Manufacturers' Association. It was decided that, before a tentative proposal could be drafted, a committee would have to be appointed to study all phases of the problem as disclosed by the report. Also, that the committee should limit the scope of the tentative proposal to shipping tags of the reinforced-eyelet type only.

## Industrial Conference to Open at Silver Bay

The eleventh annual conference on Human Relations in Industry, to be held at Silver Bay on Lake George, N. Y., under the auspices of the industrial department of the National Council of the Young Men's Christian Associations, will open on Wednesday, August 29 with an address by P. W. Wilson, publicist and former member of the British Parliament. His subject is "Labor and Leisure." Following this address, several sectional conferences will be held including a discussion on economic incentives, led by Robert B. Wolf of New York City. Prof. Michael Pupin, Columbia University scientist, will address the assembly on "Pioneering Professors," dealing with the vital relationships between college and industry.

"The Length, Breadth and Thickness of Retirement Plans" will be the theme of an address by Bryce Stewart of the Industrial Relations Counselors, Inc., on Thursday. The sectional conferences, to be held in the afternoon, will include discussions on the control of men and situations, and the foreman as a personnel developer.

R. N. Van Doren, vice-president of the Chicago & Northwestern Ry., will discuss "Some Fundamentals of Indus-

trial Harmony," Friday morning, while "Budgeting as a Means of Regularizing Employment" is the subject of a talk by Howard Coonley of Boston. Addresses scheduled for Saturday include "Management's Problem and the One Way Out," by H. N. Clarke, Counsel on Industrial Morale, Cleveland.

Arthur H. Young, Industrial Relations Counselors, Inc., is chairman of the conference, and further particulars may be obtained from Fred H. Rindge, Jr., executive secretary, National Council, Y.M.C.A., 347 Madison Ave., New York City.

# Business Items

The Ludlum Steel Co. has been given exclusive use of patents covering the manufacture of "Silcrome" alloy steel by a recent U. S. District Court decision.

The Toledo Machine & Tool Co., of Toledo, has just completed the installation of $150,000 worth of new machinery and 30 per cent increase in power plant capacity.

The Chicago Pneumatic Tool Co. and subsidiaries report for quarter ended June 30, net profit of $215,555 after depreciation, interest and federal taxes.

The Reynolds Electric Co., Chicago, has taken over the Korrectolite Co. Eben F. Oliver, formerly general manager of the absorbed company is now with the Reynolds concern.

The Herza Tool & Die Works, 225-31 West Illinois St., Chicago, has been incorporated, to manufacture and deal in tools, dies and machinery. Joseph T. Herza, Irene W. Herza and William A. Clark are the incorporators.

The American Rolling Mill Co., Middletown, Ohio, has purchased the Ashland Steel Co., of Ashland, Ky., which adjoins the Norton steel mill owned by Armco. The Ashland and Norton companies, though owned independently, were originally operated jointly.

Additions to factory buildings and equipment that will more than double the present capacity are now being made by the Bunting Brass & Bronze Co., of Toledo, to meet the demands of its expanding business, largely the result of technical and marketing research.

The D. June Machinery Co. was organized and incorporated at Waco, Tex., this month with a capital stock of $150,000, and is reported planning to enter the dealer field in the southwestern territory. The incorporators named include M. Holderman, 2004 Austin Ave., Waco.

The Covel-Hanchett Co., of Big Rapids, Mich., has purchased the Badger Tool Co., of Beloit, Wis., maker of disk-type grinding machines and double-end grinding machines of either the disk or ring type. The Badger plant will be moved to Big Rapids, and the complete line will be continued.

The Alden Manufacturing Co., Brockton, Mass., has acquired the Johnson Tool & Moulding Co., of East Weymouth, Mass., and will center operations at Brockton. President E. G. Johnson and several expert craftsmen of the Johnson company will be retained. The Alden company manufactures radio parts.

The Austin Machinery Corporation, of Muskegon, recognized as one of the largest manufacturers of road-building machinery in the United States, went into receivership on July 19 on petition of the Chatham & Phoenix National Bank and Trust Co. of New York, holders of a $3,000,000 bond issue. Interest has been due on the bonds since August, 1924. The receivership order named Otto Seyferth, vice-president and general manager of the company, as receiver.

R. Hoe & Co., manufacturers of printing presses, of New York, are moving from their site on Grand St., which they occupied for more than 100 years, to one in the Bronx. The old De Lavergne refrigerating machine plant extending from the East River to the N. Y., N. H. & H. R.R. at 138th St. has been purchased by H. R. Swartz, president of the Hoe concern.

The Cedar Rapids Pump & Supply Co. of Cedar Rapids, Iowa, and the Central Steel Products Co. of Clinton, Iowa, have been merged as the Central Steel Products Co., with headquarters in the Merchants National bank, Cedar Rapids, in a new $500,000 corporation of which $350,000 stock is preferred issue. W. C. La Tourette is chairman of the board; C. A. DePue, president; B. W Wentzel, vice-president; Charles L. Kidd, secretary and L. DePue, treasurer. The Cedar Rapids Pump, established in 1885, one of the oldest industries in the city, manufactures plumbing, heating, factory and well supplies and power pumping equipment, and the Central Steel specializes in pipe nipples and general fabrication of raw pipe. Both lines will be continued and both plants operated under the merged company.

# Personals

W. B. McSkimmon, president of the Union Twist Drill Co. and associated interests, recently sailed for Europe.

C. M. Rutledge, formerly with the Columbia Tool Steel Co., has become associated with the Chicago office of the Vanadium-Alloys Steel Corporation.

C. H. Johnson, vice-president of the Gisholt Machine Co., of Madison, Wis., is sailing for Europe on the S. S. Leviathan, August 4.

C. F. Foell, recently connected with the Worthington Pump & Machinery Corporation, Holyoke, Mass., has become associated with W. C. Lipe, Inc., Syracuse, N. Y., as assistant to the manager.

John J. Loughran has resigned as chief draftsman of the Adriance Machine Works, Brooklyn, N. Y., and has become associated with the Doehler Die Casting Co., as chief engineer of the Pottstown, Pa., plant.

Alfred V. de Forest, research engineer for the American Chain Co., was recently awarded the Dudley Medal of the American Society for Testing Materials in recognition for his development of a device for the magnetic analysis of steel.

Wilson P. Hunt, Moline, Ill., was elected president of the quad-city section, American Society of Mechanical Engineers, to succeed Lieut.-Col. G. F. Jenks, resigned, who is leaving soon to take special work at Harvard.

J. W. Barritt, formerly supervisor of apprentices at the South Philadelphia Works of the Westinghouse Electric & Manufacturing Co., will open a private engineering school at Moore, Pa., to be known as the Central Technical Institute.

Dr. W. H. Hatfield, director of the Brown-Firth Research Laboratories, Sheffield, England, will deliver the Campbell Memorial Lecture during the annual convention of the American Society for Steel Treating in the week of Oct. 8 at Philadelphia. His subject will be "The Application of Science to the Steel Industry."

Robert Thurston Kent, of New York City, has been engaged by Divine Brothers Co., of Utica, N. Y., as manager of the sales and engineering departments. Howard E. Boardman, his predecessor, has resigned to accept a position with a large organization in New York City. Mr. Kent is editor and author of "Kent's Mechanical Engineer's Handbook," and is prominent in the American Society of Mechanical Engineers.

Dr. George Fillmore Swain, of Harvard, has received the first award of the Benjamin G. Lamme gold medal for "accomplishment in technical teaching or actual advancement of the art of technical training." The medal is given by the Society for the Promotion of Engineering Education. Dr. Swain has been associated with a number of engineering enterprises, mainly in the field of transportation. Since 1909, he has been a member of the faculty of the Harvard Engineering School.

# Obituaries

Hollen S. Thompson, president of the Hill Pump Valve Co., Chicago, died on July 19, following an operation.

James McNaughton, vice-president of the Baldwin Locomotive Works, of New York, died on July 29 at his home in Bronxville, N. Y.

Thomas G. Smallwood, Cincinnati district manager of the Chicago Pneumatic Tool Co., of New York, died on July 20 at the age of 65. He had been manager of the Cincinnati office for 14 years.

William H. Fauber, an inventor who held several basic patents for hydroplanes, died on July 28 at his home in Brooklyn. He was for many years a manufacturer of bicycles and appliances for them, having plants at Chicago and Elgin.

# Forthcoming Meetings

**Canada's Steel and Power Show.** Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

**American Railway Tool Foremen's Association.** Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

**American Railway Tool Foreman's Association.** Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

**Machine Shop Practice Division, American Society of Mechanical Engineers.** National meeting, Cincinnati, Sept. 24-26. Part of sessions to be on steamer "Cincinnati." Secretary, Carlos de Zafra, 29 W. 39th St., New York City.

**National Safety Council.** Seventeenth annual safety congress to be held in New York, October 1-5. W. H. Cameron, managing director, 108 E. Ohio St., Chicago.

**American Society for Steel Treating.** "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

**American Welding Society.** Fall meeting and exposition, Exhibition Hall of Commercial Museum, Philadelphia, Pa., Oct. 8-12, in conjunction with "National Metals Exposition" of the American Society for Steel Treating. Miss M. M. Kelly, secretary, 29 West 39th St., New York City.

**Institute of Metals,** Division of American Institute of Mining and Metallurgical Engineers. Annual fall meeting during National Metal Week, Oct. 8-12, Benjamin Franklin Hotel, Philadelphia. W. M. Corse, secretary, 810 18th St., N. W., Washington, D. C.

**American Gear Manufacturers Association.** Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

**American Management Association.** Autumn convention, Palmer House, Chicago, Nov. 13-15. W. J. Donald, managing director, 20 Vesey St., New York City.

**Iron and Steel Division, American Society of Mechanical Engineers.** Second national meeting, Chicago, November 14-15. Thomas Wilson, chairman of Chicago local section, host, 7 S. Dearborn St., Chicago.

# The Weekly Price Guide

### *Rise and Fall of the Market*

THE market for materials and supplies in the metal working industries shows firmness compared with that of several weeks ago. Pig iron, scrap, semi-finished and finished steel, give no sign of recession from present levels. Steel buying remains active in pipe, automotive and agricultural implement material, structurals and reinforcing bars. Demand for freight car material, on the other hand, is exceptionally light. The non-ferrous metals market is fairly strong, particularly in brass and copper. Miscellaneous materials, such as lubricants, tin plate and white-lead, hold steadily to quoted prices.

*(All prices as of July 27, 1928)*

## IRON AND STEEL

**PIG IRON**—Per gross ton, f.o.b.:

| | |
|---|---|
| CINCINNATI | |
| No. 2 Southern | $19.69 |
| Northern Basic | 20.89 |
| Southern Ohio No. 2 | 21.19 |
| NEW YORK—Tidewater Delivery | |
| Southern No. 2 (silicon 2.25@2.75) | 25.62 |
| BIRMINGHAM | |
| No. 2 Foundry | 16.00 |
| PHILADELPHIA | |
| Eastern Pa., No. 2x (silicon 2.25@2.75) | 20.76 |
| Virginia No. 2 | 27.17 |
| Basic | 19.76 |
| CHICAGO | |
| No. 2 Foundry local (silicon 1.75@2.25) | 20.00 |
| No. 2 Foundry, Southern (silicon 2.25@2.75) | 22.01 |
| PITTSBURGH, including freight charge ($1.76) from Valley: | |
| No. 2 Foundry | 19.26 |
| Basic | 19.26 |
| Bessemer | 21.26 |

**IRON MACHINERY CASTINGS**—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

| | |
|---|---|
| Detroit | 4.50 |
| Cleveland | 5.00 |
| Cincinnati | 4.30 |
| New York | 5.25 |
| Chicago | 4.50@4.75 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

| Blue Annealed | Pittsburgh Mill Base | Chicago | Cleveland | New York |
|---|---|---|---|---|
| No. 10 | 2.10@2.20 | 3.50 | 3.25 | 3.90* |
| No. 12 | 2.15@2.25 | 3.55 | 3.30 | 3.95* |
| No. 14 | 2.25@2.30 | 3.60 | 3.35 | 4.00* |
| No. 16 | 2.35@2.40 | 3.70 | 3.45 | 4.10* |
| Black | | | | |
| Nos. 18 to 20 | 2.50@2.60 | 3.75 | 3.45 | 4.00 |
| No. 22 | 2.65@2.75 | 3.90 | 3.60 | 4.15 |
| No. 24 | 2.70@2.80 | 3.95 | 3.65 | 4.20 |
| No. 26 | 2.80@2.90 | 4.05 | 3.75 | 4.30 |
| No. 28 | 2.95@3.05 | 4.20 | 3.90 | 4.45 |
| Galvanized | | | | |
| No. 10 | 2.95@3.05 | 4.10 | 3.70 | 4.25 |
| Nos. 12 to 14 | 3.05@3.15 | 4.20 | 3.80 | 4.35 |
| No. 16 | 3.15@3.25 | 4.30 | 3.90 | 4.45 |
| No. 18 | 3.30@3.40 | 4.45 | 4.05 | 4.60 |
| No. 20 | 3.45@3.55 | 4.60 | 4.25 | 4.75 |
| No. 22 | 3.50@3.60 | 4.65 | 4.30 | 4.80 |
| No. 24 | 3.65@3.75 | 4.80 | 4.40 | 4.95 |
| No. 26 | 3.90@4.00 | 5.05 | 4.65 | 5.20 |
| No. 28 | 4.15@4.25 | 5.30 | 4.90 | 5.45 |

*250 to 3,999 lb.

**WELDED STEEL PIPE**—Warehouse discounts are as follows:

| | New York Black | New York Galv. | Cleveland Black | Cleveland Galv. | Chicago Black | Chicago Galv. |
|---|---|---|---|---|---|---|
| 1 to 3 in., butt welded | 50% | 36% | 55½% | 43½% | 54% | 41% |
| 2½ to 6 in., lap welded | 45% | 32% | 53½% | 40½% | 51% | 38% |

WROUGHT-STEEL PIPE LIST

| Size, Inches | List Price per Foot | Diameter in Inches—External | Diameter in Inches—Internal | Thickness Inches |
|---|---|---|---|---|
| 1 | $0.17 | 1.315 | 1.049 | .133 |
| 1¼ | .23 | 1.66 | 1.38 | .14 |
| 1½ | .27½ | 1.9 | 1.61 | .145 |
| 2 | .37 | 2.375 | 2.067 | .154 |
| 2½ | .58½ | 2.875 | 2.469 | .203 |
| 3 | .76½ | 3.5 | 3.068 | .216 |
| 3½ | .92 | 4.0 | 3.548 | .226 |
| 4 | 1.09 | 4.5 | 4.026 | .237 |
| 4½ | 1.27 | 5.0 | 4.506 | .247 |
| 5 | 1.48 | 5.563 | 5.047 | .258 |
| 6 | 1.92 | 6.625 | 6.065 | .28 |

**SEAMLESS STEEL TUBING**—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

| Thickness—Decimal | Thickness—B.w.g. and Fractions | Outside Diameter in Inches—½ | ⅝ | ¾ | ⅞ | 1 | 1⅛ | 1¼ |
|---|---|---|---|---|---|---|---|---|
| | | Price per Foot | | | | | | |
| .035" | 20 | $0.15 | $0.16 | $0.17 | $0.18 | $0.19 | $0.21 | $0.23 |
| .049" | 18 | .17 | .18 | .19 | .20 | .21 | .23 | .25 |
| .065" | 16 | .19 | .20 | .21 | .22 | .23 | .25 | .27 |
| .083" | 14 | .20 | .22 | .23 | .24 | .25 | .27 | .29 |
| .095" | 13 | .21 | .23 | .25 | .26 | .27 | .29 | .31 |
| .109" | 12 | .22 | .24 | .26 | .27 | .28 | .30 | .32 |
| .120" or .125" | 11 | .23 | .25 | .27 | .28 | .29 | .31 | .33 |
| .134" | 10 | .24 | .26 | .28 | .29 | .30 | .32 | .34 |

**MISCELLANEOUS**—Warehouse base prices in cents per lb.:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Spring steel, light* | 4.50 | 4.65 | 4.65 |
| Spring steel, heavier | 4.00 | 4.00 | 4.00 |
| Coppered Bessemer rods | 6.05 | 6.00 | 6.20 |
| Hoop steel | 4.50‡ | 4.00 | 4.15 |
| Cold rolled strip steel | 6.25 | 6.00 | 6.10 |
| Floor plates | 5.10‡ | 5.30 | 5.00 |
| Cold drawn, round or hexagon† | 3.40 | 3.65 | 3.60 |
| Cold drawn, flat or square† | 3.90 | 4.15 | 4.10 |
| Structural shapes | 3.30‡ | 3.00 | 3.10 |
| Soft steel bars | 3.25‡ | 3.00 | 3.00 |
| Soft steel bar shapes | 3.25‡ | 3.00 | 3.00 |
| Soft steel bands | 4.00‡ | 3.65 | 3.65 |
| Tank plates | 3.30‡ | 3.00 | 3.10 |
| Bar iron (2.75 at mill) | 3.24 | 3.00 | 3.00 |
| Drill rod (from list) | 60% | 55% | 50% |

*Flat, 1/16@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½ 7.35c. per lb.

## METALS

Warehouse Prices in Cents Per Pound for Small Lots:

| | | | |
|---|---|---|---|
| Copper, electrolytic, New York | | | 15.50 |
| Tin, straits, pigs, New York | | | 49.50 |
| Lead, pigs, E. St. Louis | 6.00 | New York | 7.75 |
| Zinc, slabs, E. St. Louis | 6.20 | New York | 7.75 |

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Antimony, slabs | 12.50 | 13.00 | 14.25 |
| Copper sheets, base | 23.50 | 23.50 | 23.50 |
| Copper wire, base | 20.12½ | 19.62½ | 16.75* |
| Copper bars, base | 22.00 | 22.00 | 22.50 |
| Copper tubing, base | 25.00 | 25.00 | 25.00 |
| Brass sheets, high, base | 19.25 | 19.25 | 19.25 |
| Brass tubing, high, base | 24.12½ | 24.12½ | 24.12½ |
| Brass rods, high, base | 17.00 | 17.00 | 17.00 |
| Brass wire, high, base | 19.75 | 19.75 | 19.75 |

*At mill.

# Shop Materials and Supplies

## METALS—Continued

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Aluminum ingots, 99% | 25.00* | 24.30 | 24.30 |
| Zinc sheets (casks) | 10.00@10.50 | 11.00 | 9.61 |
| Solder (strictly) | 31.00 | 31.50 | 31@34 |

Babbitt metal, delivered in case lots, New York, cents per lb.:

| | |
|---|---|
| Genuine, highest grade | 66.00 |
| Commercial genuine, intermediate grade | 53.00 |
| Anti-friction metal, general service | 31.50 |
| No. 4 babbitt (f.o.b.) | 12.25 |

Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:

Ingots..... 35.00 Electrolytic.. 37.00 Shot..... 36.00

*Delivered.

**SPECIAL NICKEL AND ALLOYS**—Price in cents per lb., f.o.b. Huntington, W. Va.:

| | |
|---|---|
| Full finished nickel sheet (base) | 52.00 |
| Cold rolled nickel sheet (base) | 60.00 |
| Hot rolled rods, Grade "A" (base) | 45.00 |
| Cold drawn rods, Grade "A" (base) | 53.00 |

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

| | | | |
|---|---|---|---|
| Shot | 28.00 | Hot rolled rods (base) | 35.00 |
| Blocks | 28.00 | Cold drawn rods (base) | 43.00 |
| Cold rolled sheets (base) | 50.00 | Full finished sheets (base) | 42.00 |

**OLD METALS**—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Crucible copper | 12.75 @13.00 | 12.00 | 11.75@12.25 |
| Copper, heavy, and wire | 12.00 @12.75 | 11.25 | 11.25@11.75 |
| Copper, light, and bottoms | 10.75 @11.25 | 9.75 | 10.00@10.50 |
| Heavy lead | 4.87½@ 5.12½ | 5.25 | 4.50@ 5.00 |
| Tea lead | 3.50 @ 3.75 | 3.75 | 3.50@ 4.00 |
| Brass, heavy, yellow | 7.12½@ 7.37½ | 7.75 | 7.25@ 7.75 |
| Brass, heavy, red | 10.00 @10.25 | 10.00 | 9.50@ 9.75 |
| Brass, light | 5.50 @ 6.00 | 6.25 | 6.25@ 6.75 |
| No. 1 yellow rod turnings | 8.00 @ 8.25 | 7.75 | 7.50@ 8.00 |
| Zinc | 3.25 @ 3.50 | 3.25 | 2.87½@3.37½ |

**TIN PLATES**—Charcoal—Bright—Per box.

| | | New York | Cleveland | Chicago |
|---|---|---|---|---|
| "AAA" Grade: | | | | |
| IC, | 14x20 | $12.10 | $11.95 | $11.50 |
| "A" Grade: | | | | |
| IC, | 14x20 | 9.70 | 9.90 | 9.50 |
| | Coke Plates—Primes—Per box | | | |
| 100-lb., | 14x20 | 6.45 | 6.10 | 7.00 |
| | Terne Plates—8-lb. Coating—Small lots—Per box | | | |
| IC, | 14x20 | 7.75@8.00 | 7.00 | 7.50 |

## MISCELLANEOUS

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Cotton waste, white, per lb.* | $0.10@0.13½ | $0.16 | $0.15 |
| Cotton waste, colored, per lb.* | .09@ .13 | .12 | .12 |
| Wiping cloths, washed white, per lb | .15½ | 38.00 per M | .17 |
| Sal soda, per lb | .02 | .02 | .02 |
| Roll sulphur, per lb | .027 | .03½ | .04 |
| Linseed oil, raw, in 1 to 4 bbl. lots, per lb | .108 | .105 | .108 |
| Cutting oil, about 25% lard, in 5 gal. cans, per gal | .65 | .60 | .60 |
| Machine oil, medium-bodied (55 gal. steel bbl.) per gal | .30 | .36 | .36 |
| Belting—Present discounts from list in fair quantities (½ doz. rolls). | | | |
| Leather—List price, 24c. per lin.ft. per inch of width for single ply.: | | | |
| Medium grade | 30–10% | 35% | 35% |
| Heavy grade | 25– 5% | 30% | 30% |
| Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.: | | | |
| First grade | 50% | 50–10% | 50% |
| Second grade | 60% | 60–5% | 50–10% |

*All waste in bale lots.

## *Comparative Warehouse Prices*

| New York | Unit | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|---|
| Soft steel bars | per lb. | $0.0325 | $0.0325 | $0.0324 |
| Cold drawn shafting | per lb. | .034 | .034 | .04 |
| Brass rods | per lb. | .17 | .17 | .1575 |
| Solder (½ and ½) | per lb. | .31 | .315 | .39 |
| Cotton waste, white | per lb. | .10@.13½ | .10@.13½ | .10@.13½ |
| Emery disks, cloth, No. 1, 6-in. dia | per 100 | 3.10 | 3.10 | 3.10 |
| Lard cutting oil | per gal. | .65 | .65 | .65 |
| Machine oil | per gal. | .30 | .30 | .27 |
| Belting, leather, medium | off list | 30–10% | 31½% | 40–5% |
| Machine bolts, up to 1x30 in., full kegs | off list | 50%* | 50%* | 50%* |

*List prices as of April 1, 1927.

## MISCELLANEOUS—Continued

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets: | | | |
| *Flint paper | $5.40 | $4.95 | $5.13 |
| *Emery paper | 10.71 | 9.15 | 10.71 |
| †Emery cloth | 27.84 | 27.85 | 27.84 |
| Emery disks, 6 in. dia., No. 1, per 100: | | | |
| Paper | 1.29 | 1.27 | 1.32 |
| Cloth | 3.10 | 3.05 | 3.05 |
| Fire clay, per 100 lb. bag | 1.00 | .75 | .75 |

| | | |
|---|---|---|
| Coke, prompt furnace, per net ton | Connellsville, | 2.25@2.50 |
| Coke, prompt foundry, per net ton | Connellsville, | 3.25@3.75 |
| White lead, dry or in oil | 100 lb. kegs | New York, 13.25 |
| Red lead, dry | 100 lb. kegs | New York, 13.25 |
| Red lead, in oil | 100 lb. kegs | New York, 14.75 |

*4½ reams and under. †Less than 2 reams.

## SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

| | Full Kegs or Cases |
|---|---|
| Machine bolts, square heads and nuts: | |
| Up to ¾ x 6-in. | 55% |
| Larger up to 1 x 30-in. | 50% |
| 1⅛ and 1¼ in. dia. | 35% |
| Carriage bolts: | |
| Up to ½ x 6-in. | 55% |
| Larger sizes | 50% |
| Coach and lag screws: | |
| Up to ½ x 6-in. | 55% |
| Larger sizes | 50% |
| Tap bolts, hexagonal heads | 40% |
| Nuts: | |
| Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl. | 55% |
| Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl. | 55% |
| Semi-finished, hexagonal, tapped, in packages, all sizes | 40% |
| Case hardened, hexagonal, tapped, in packages, all sizes | 30% |
| Washers: Deduct from list, per 100 lb | $3.50* |
| Rivets, button and cone head: | |
| Small, including 1/16-in. dia. | 50–10% |
| Large (base) per 100 lb. net | $5.00† |

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.

*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

# Machine Requirements and Industrial Construction

## Equipment Wanted

**Mass., Boston** — Bellamy-McKim Co., 76 Columbus Ave. — woodworking machinery including bandsaws, benches, double and single surfacers, tenoners, etc.

**O., Canton**—F. R. Hannon Electric Co., 2505 Fourth St.—¾ to 2 in. pipe bending machine.

**Wash., Seattle**—Northwest Lead Co., 1742 4th St.—equipment for the manufacture of lead pipe, pig lead, bar lead, lead wool, wire tubing, etc. to cost $50,000 for proposed extensions and improvements to plant.

**Ont., Chatham** — Bd. of Education, B. Kendrick, Chn. — prices and catalogs on metal working and wood working tools and machinery for rebuilding of vocational school recently destroyed by fire. Estimated cost $80,000.

**Ont., Petrolea**—Gale Iron Works Ltd., A. W. Lau, Mgr.—equipment for the manufacture of steel sash pressed steel stairs and ornamental iron work for recently acquired plant.

**Ont., Walkerville**—Bd. of Education, W. Thorburn, Secy., 251 Victoria Rd.—prices and catalogs on machinery and equipment for manual training shops, etc. Estimated cost $250,000.

## Opportunities for Future Business

**Calif., Berkeley**—California Electric Refrigeration Corp., Jerrold Ave. and Napoleon St., San Francisco, is having plans prepared for a 1 story factory on Fifth St. Estimated cost $40,000. Private plans.

**Calif., Los Angeles**—Victor Talking Machine Co., c/o W. Knowles, 1214 Webster St., Oakland, Archt., is having plans prepared for the construction of a factory. Estimated cost $250,000.

**Calif., Oakland**—Weaver-Wells Co., 3321 Broadway, awarded contract for a 1 story auto service building at Broadway and 29th St. Estimated cost $137,630.

**Calif., Sacramento**—Bd. of Education, is having plans prepared for a 3 story school including manual training shops, etc. at 4th and Q Sts. Estimated cost $300,000. Dean & Dean, California Life Bldg., Archts.

**Conn., Waterbury**—Bristol Co., Platts Mills, manufacturers of recorders, is having preliminary plans prepared for the construction of factory. Estimated cost $40,000. F. A. Webster, 51 West Main St., Archt.

**Ill., Aurora**—Trindl Corp., 2917 South Wabash Ave., Chicago, awarded general contract for a 1 story, 125 x 235 ft. factory for the manufacture of automobile engine parts. Estimated cost $55,000.

**Ill., Chicago**—Crown Pheostat & Supply Co., 1908 Maypole Ave., awarded contract for the design and construction of a 40 x 46 ft. addition to plant.

**Ill., Chicago**—C. E. Frazier, 64 West Randolph St., Archt., awarded contract for a 2 story, 33 x 125 ft. addition to machine shop on West Walnut St. for F. E. Hummel & Co., 1600 Fulton St. Estimated cost $15,000.

**Ill., Chicago**—A. Epstein, 2001 West Pershing Rd., Archt., is receiving bids for a 1 and 2 story, 300 x 305 ft. factory for the manufacture of screw drivers, valve lifters, wrenches, wheel puller, bottle cappers, can openers, mouse traps, drop forges, hammers, etc. at 47th St. and South St. Louis Ave. for Indestro Mfg. Co., 2650 Coyne St. Estimated cost $800,000.

**Ill., Chicago**—David Lupton's Sons, Tulip St. and Allegheny Ave., Philadelphia, Pa., awarded general contract for first unit of plant, 150 x 500 ft., for the manufacture of steel windows here.

**Ill., Chicago**—Mills Novelty Co., 4100 Fullerton Ave., manufacturers of slot machines, awarded contract for a 4 story, 60 x 229 ft. factory at 4100-18 Fullerton Ave. Estimated cost $120,000.

**Ill., Chicago**—Pheoll Mfg. Co., 5700 West Roosevelt Rd., manufacturers of wood and iron screws, etc., will soon award contract for a 1 story, 91 x 280 ft. addition to factory. Estimated cost $40,000. A. S. Alschuler, 28 West Jackson Blvd., Archt.

**Ind., Vincennes**—Lenehan & Dunphy, will soon award contract for a 1 story, 150 x 280 ft. garage at 5th and Vigo Sts. Estimated cost $150,000. J. B. Bayard, Archt. Noted June 21.

**La., Shreveport**—C. A. Parker, 533 Vine St., awarded contract for a 3 story garage at 311 Edwards St. Estimated cost $125,000.

**Me., Auburn**—Androscoggin Foundry, L. MacFadden Supt., 31 Washington St., awarded contract for the construction of a 1 story foundry.

**Mass., Cambridge** (Boston P. O.)—J. Shapiro, 27 School St., Boston, will build a 2 story additional unit to auto parts building at Vassar St. here. A. Kahn, Marquette Bldg., Detroit, Mich., Archt. B. Brown, 65 Franklin St., Boston, Engr. Chevrolet Motor Co., 277 Massachusetts Ave., Cambridge, lessee.

**Mass., Taunton**—H. Jones, 93 Hart St., is receiving bids for a 1 story, 75 x 100 ft. repair and service garage on County St. Estimated cost $40,000. D. Shapiro, Globe Bldg., Fall River, Archt.

**Mass., Swampscott** (Lynn P.O.) F. I. Richardson, 26 New Ocean St., awarded contract for a 1 story, 70 x 150 ft. repair and service garage at Kings Beach. Estimated cost $50,000. Noted July 5.

**Mich., Flint** — Chevrolet Motor Co., awarded contract for a 1 story, 26 x 200 ft. addition to factory on Chevrolet Ave. Estimated cost $50,000.

**Minn., St. Cloud**—International Harvester Co. of America, W. D. Price, Const. Supt., 606 South Michigan Ave., Chicago, Ill., will soon award contract for a 2 story warehouse and sales and service building at St. Germain St. and Northern Pacific Ry. tracks. Estimated cost $150,000. Private plans.

**Minn., St. Paul**—Ballard Storage & Transfer Co., 16 East 4th St., c/o Abbott-Miller Co., 317 Commerce Bldg., plans the construction of a 4 story garage at Third and Wabasha Sts. Estimated cost $250,000. Architect not announced.

**Mo., Fulton**—Missouri School for Deaf, H. E. Day, Supt., awarded contract for 3 story, 48 x 98 ft. manual training shops. Estimated cost $39,910. Noted July 19.

**Mo., Kansas City**—Kansas City Power & Light Co., 14th St. and Grand Ave., will receive bids about Aug. 15 for a 4 story, 125 x 142 ft. garage. Estimated cost $150,000. Private plans.

**N. H., Keene**—Kingsbury Machine Co., Myrtle St., awarded contract for a 2 story addition to factory.

**N. J., Red Bank**—V. J. Eck, Broad St., Archt., is receiving bids for a 2 story, 75 x 100 ft. auto sales building at Harding Rd. and Broad St. for H. L. Zobel Co. Estimated cost $150,000.

**N. Y., Brooklyn**—Parkway Center Building Corp., A. Kanter, Pres., 26 Court St., plans the construction of a 2 story, 100 x 157 ft. garage at East New York and Schenectady Aves. Estimated cost $40,000. H. M. Sushan, 367 Fulton St., Archt.

**N. Y., Brooklyn**—Quiseppe Pallegrino, 874 Metropolitan Ave., plans the construction of a 1 story, 70 x 100 ft. shop at Metropolitan Parkway and Catherine St. Estimated cost $25,000. Laspia & Samenfeld, 269 Broadway, New York, Archts.

**N. Y., New York**—W. Hagedour, 1895 First Ave., plans a 2 story, 100 x 148 ft. garage at Jerome Ave. and 182nd St. Estimated cost $85,000. C. Schaefer, 332 East 149th St., Archt.

**N. Y., New York**—One Thousand Eight Hundred Twenty Eight First Ave. Corp., W. Kessler, Pres., 220 West 42nd St., awarded contract for a 2 story garage at 95th St. and First Ave. Estimated cost $150,000.

**N. Y., New York**—W. Schwere, 1242 Mayflower Ave., plans the construction of a garage at Seabury and Westchester Aves. Estimated cost $60,000. J. J. Dunigan, 2382 Grand Concourse, Archt.

**N. Y., New York**—L. Silver, 391 East 149th St., is receiving bids for a garage at Fordham Rd. and Bathgate Ave. Estimated cost $50,000. Cohen & Siegel, 45 West 57th St., Archts.

**N. Y., Yonkers**—Yonkers Electric Light & Power Co., 130 East 15th St., New York, awarded contract for the construction of a garage at Columbus Pl. and Nepperhan St. Estimated cost $200,000.

**O., Cleveland**—Eaton Axle & Spring Co., C. I. Ochs, Pres. and Gen. Mgr., East 65th St. and Central Ave. had plans prepared for a 1 story, 120 x 340 ft. factory on East 140th St. Estimated cost $175,000. G. S. Rider Co., Century Bldg., Archt.

**O., Cleveland**—Grabler Mfg. Co., M. C. Rosenfeld, V. Pres., 6565 Broadway, had plans prepared for a 1 story, 35 x 80 ft. addition to factory. Estimated cost $40,000. Gristian, Schwarzenberg & Gaede, 1900 Euclid Bldg., Archts.

**O., Cleveland**—Nickel Plate Development Co., c/o W. G. Bergen, Terminal Tower, awarded contract for a 1 story, 50 x 261 ft. warehouse on Commercial Rd. Estimated cost $150,000.

**O., Cleveland** — Willard Storage Battery Co., R. C. Norberg, Pres. and Gen. Mgr., 246 East 131st St., had plans prepared for a 1 story 64 x 212 ft. factory at 246 East 131st St. Estimated cost $100,000. Private plans.

**O., Columbus**—Armstrong Furnace Co., M. B. Armstrong, Pres., London, is having plans prepared for the construction of a factory here. Estimated cost $135,000. Pri-Private plans.

**O., Marysville**—Federal Brass & Mfg. Co., plans the construction of a 1 story, 25 x 70 ft. factory. Estimated cost $20,000. Private plans.

**Okla., Maud**—American Foundry Co., is having preliminary plans prepared for the construction of a foundry and machine shop. Estimated cost $40,000. Private plans.

**Pa., Pittsburgh**—Carnegie Steel Co., Carnegie Bldg., will build a 1 story, 284 x 307 ft. warehouse at Lighthill St. Estimated cost $296,000. Private plans.

**Tex., Amarillo**—City, c/o J. D. Bartlett, Mgr., plans an election soon to vote $45,000 bonds for the construction of an airport including 80 x 100 ft. hangar, machine shops, etc. H. B. Jones, Engr.

**Wash., Seattle**—W. E. Grimshaw, c/o H. Bittman, Securities Bldg., Archt., will soon receive bids for a 6 story, 60 x 108 ft. garage at 1915 Third Ave. Estimated cost $150,000. Noted July 19.

**Wis., Milwaukee**—Dept. of Public Works, will soon award contract for a 2 story, 100 x 140 ft. repair shop, etc. on Virginia St. Private plans. Noted June 28.

**Ont., Galt**—Galt Art Metal Co., plans the construction of a 1 story, 60 x 150 ft. press room on Dundas St. Estimated cost $40,000. Architect and engineer not announced.

**Ont., Toronto**—Service Station Equipment Co., Ltd., 510 King St., E., is receiving bids for a 1 story, 100 x 400 ft. factory on Coxwell Ave. Estimated cost $200,000. D. Brouse, 510 King St. E., Engr. Noted July 19.